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Inspectors of Explosives Annual Report

THE annual report of H.M. Inspectors of Explosives for 1936 is, on the whole, satisfactory, and shows that the number of accidents due to explosives which occurred last year was in keeping with the gradual decrease in accidents of this nature which has taken place within recent years. The total number of accidents in manufacture, keeping, conveyance, use and miscellaneous, was 317, the number of persons killed being 25, and injured 273. In 1935 the same number of accidents occurred but the number of persons killed were 27 and those injured 302. Although the total accidents for last year were slightly above the average for the last ten years (308), both the numbers of killed and injured were below average, the mean figures for these classes being 31.5 and 287.6 respectively.

The Inspectors draw attention in the present report to two dangers which have caused unnecessary accidents. The first is the use of petrol for cleaning purposes and does not concern us very closely here, but the second refers to explosions which have occurred during the preparation of fireworks, containing potassium chlorate and sulphur or phosphorus, by unskilled persons. This matter has been mentioned in previous reports and last year circulars were again sent out to manufacturers of chemical sets requiring the exclusion of these substances, which are prohibited by Orders in Council. It appears to be desirable, however, to take the matter further than that. A young amateur purchasing a set of chemicals will in all probability quickly tire of the experiments set out in the instruction book accompanying the set, and will endeavour to make spectacular experiments on his own account, and the more spectacular the better. To the young mind, the preparation of fireworks and explosives are regarded as highly desirable experiments, and if the set obtained does not contain all the ingredients necessary to this end, the remainder will be secured if possible. The sale of chemical sets to the young, therefore, constitutes a direct incentive to meddle with dangerous chemicals and should be prohibited. Apart from the question of explosions, all chemicals are more or less poisonous, and on this ground, also, their sale to this class of person should be restricted.

A serious fire resulting in the death of two workmen occurred in the handling of damped collodion cotton, and this case is of importance to all users of this material, such as lacquer and celluloid manufacturers, etc. The accident took place when metal drums were being packed with collodion cotton damped with 33⅓ per cent. toluene. The material was well outside the provisions of the Explosives Acts, which regards collodion cotton damped with not less than 25 per cent. toluene as beyond its scope. In this instance the damped collodion was rammed down in the metal drum by means of a brass rammer, and ignition occurred. On investigation it was decided that the most probable cause of the accident was the impact of a small portion of partially dried material between the metal drum and the brass rammer. It was subsequently shown that dry collodion cotton would only absorb about 8 per cent. of toluene when in contact with the damped material, so that the necessity of thorough damping throughout, avoiding evaporation of the damping liquid, is obvious. Even when thorough damping has been obtained, such drastic operations as ramming should be avoided.

Six acetylene accidents were reported, two of which were concerned with acetylene generators. An interesting point arose in a fire which occurred in an acetylene compressing and charging room and which was most probably due to the fracture of one of the cylinders. The compressing room was fitted with a remote control button to stop the compressors, and although four men passed this button none thought of pressing it. The point which was uppermost in their mind was to send for the fire brigade. The existence of such emergency controls is forgotten if only very rarely used and fire drills would be beneficial in this direction. Among miscellaneous accidents, two were due to the use of a cylinder of oxygen in mistake for compressed air. Clearer warning labels have now been affixed to oxygen cylinders in order to prevent such mistakes arising, but the painting of the cylinders in a more distinctive colour or colours than that at present employed and rifling of the surface of the cylinder, as in the case of poison bottles, would be still more efficacious. Few accidents occurred during the filling of percussion caps and detonators. These were mainly caused by workers leaving the protective screens.

In general it can be said that the number of accidents due to explosives of all kinds is small when the amount of explosive substances manufactured, handled and used is taken into account. An explanation is that as the explosions which could occur would be of the most serious type, care is taken by the employers to see that the workmen are fully conversant of the nature of the material with which they are dealing. As a result, each individual man realises that his own safety and that of many of his fellow-workmen depends on the performance of his duties exactly as instructed, with strict observance of all necessary precautions. It is only when a workman does not completely understand the properties of the material which he is handling, and the direction in which dangers arise, that he is liable to underestimate the human and material damage that the substance can bring about. The cause of a number of general accidents in factories mentioned in the Factory Inspector's report can be directly traced to this source.

Notes and Comments

The British Association Meeting

THE full programme of events has now been published for the annual meeting of the British Association for the Advancement of Science to be held at Nottingham from September 1 to 8 under the presidency of Professor Sir Edward Poulton, F.R.S. Meetings of the chemistry section will be held in University College, Nottingham, and will be opened on September 2 by a symposium on some aspects of chemotherapy, the presidential address being given by Dr. F. L. Pyman, F.R.S. September 3 will be devoted to a symposium on protein chemistry and on September 6 and 7, symposia will be held on surface action in biology and the chemistry of building materials respectively. Arrangements have been made for a number of works visits to be paid during the meeting. In the past these have proved very popular and form an important part of the programme. This year the works visits for the chemistry section comprise Boots Pure Drug Co., Ltd., Stanton Iron Works, Ltd., John Player & Sons, Ltd., and International Combustion Co., Ltd. The Association states that it has considered the growing strength of the public demand for a more systematic presentation of selected subjects of scientific investigation in their bearing on the life of the community. It is intended to group together in a definite series each year certain contributions in which the more immediate public interest will be stressed. In the list for this year's meeting, contributions on chemical subjects are conspicuous by their absence.

Lime for the Land

FOLLOWING the first meeting of the Land Fertility Committee, it was announced that as from September 6 next lime or basic slag delivered to agricultural land may be made the subject of an application for an Exchequer contribution. It is required that the lime or basic slag be produced in the United Kingdom, is delivered to the land in not less than two ton lots, is not mixed artificially with other materials, and is purchased from an approved supplier. The contribution, if made, will not exceed one-half of the cost in the case of lime and one-quarter in the case of basic slag. The scheme is of mutual benefit to all concerned and the Government has given a valuable fillip to the state of agriculture in this country, and, incidentally, to the approved lime and basic slag producers or suppliers. A further interesting feature of the scheme is that 2d. per ton for every ton of lime or basic slag acquired by the occupier at a price of 10s. a ton or over will be deducted from each contribution and a similar sum will be collected from the approved suppliers. The money so obtained will be paid into a fund for promoting research into the use of lime or basic slag for increasing the fertility of the soil.

Sources of Heat

ALL chemical works have need of an adequate supply of steam, which is the medium commonly used for applying heat to reaction vessels. In the absence of steam, electric current is the alternative; in certain cases direct heating by gas can be adopted. Live steam at a pressure of 100 to 300 lb. per square inch finds application in distillation, evaporation, drying, sterilising, leaching, in operating refrigerating machines, in compressing air, in pumping water and in generating electricity; exhaust steam at anything from 1 to 60 lb. per square inch is equally useful. So, also, is electricity. A steam-heated process may often be replaced by an electrically-heated process to give a better heat balance; in some cases the steam process offers no chance of improvement. In the attempt to obtain a better heat balance by any such conversion of the heating medium, however, care should be taken to see that there is no sacrifice of dependability. In equal degrees, the supply of steam and electricity at chemical works must be unfailing, because interruptions may cause the loss of more money, in terms of the value of the products, in a few hours than would be saved under a very economical heat balance throughout the year.

Steam for Distillation Processes

FOR distillation processes steam is generally used as the heating medium, but there are exceptions which should be noted and which involve the use of heated oil, mercury, direct fire, or electricity. In most cases these exceptions are outstanding because the desired temperature is higher than that conveniently supplied by steam. Stills which are heated by direct fire are often operated more cheaply than steam-heated stills, but the great advantage of being able to control the temperature easily within very fine limits, and the absence of a fire hazard, is restricted to the use of steam. Electricity, of course, also allows easy temperature control; likewise, gas with modern equipment. Exhaust steam is usually the cheapest and most satisfactory heating medium for stills which are operating under a vacuum. Where exhaust steam is in use and the supply may not be constant, and where, moreover, it is essential that the supply to the plant must not fail during the course of the process, it must be remembered that steam line must be provided to be ready to make up any deficiency. The reducing valves which are provided on the live steam line must be of a type which will automatically supply live steam as and when necessary, for plant economy rules that no live steam must be used if there is already a surplus of exhaust steam at suitable pressure.

Australian Expansion

A STATEMENT made by Mr. Lyons, in the Australian Commonwealth Parliament on Tuesday, outlined a scheme which, if put into operation, will do much towards the expansion of Australian industries. The object is not only to increase the defences of the country by enlarging the fighting forces and establishing munition factories, but to encourage the Commonwealth's industries in general and develop the production of raw materials. The country is to be as self-sufficient as possible and to add to the resources of the mother country. The plan should, therefore, be most effective in greasing the wheels of trade between Australia and Britain, and in bringing the two countries into closer relationship. It is a characteristic of this age that makes it necessary for countries to endeavour to be independent as regards the raw materials of their principal manufactures. The Australian scheme is an important step in this direction.

The Production of Pure Calcium Carbide

By
H. C. PINCAS, Ph.D.

SO far as the production of acetylene is concerned, it would be economically important if a high-grade calcium carbide, say, a product containing 90 per cent., or even more, CaC_2, could be manufactured on a large scale and in a relatively cheap way. It is, however, well known that the routine technical process yields a product containing seldom more than 80 per cent. of the valuable ingredient. Technical carbide always contains more or less unchanged lime and carbonaceous matter, the raw materials of manufacture, and even if work is done with chemically pure raw materials on a laboratory scale, and at ordinary pressure, the final product is always contaminated by the remainders of the initial compounds.

The reason why technical carbide, or carbide prepared under precautions as indicated above, is never pure resides in the complicated nature of its formation which can be represented by the following endothermic equations:

$$CaO + C \rightleftarrows Ca + CO, \quad (I)$$

$$Ca + 2C \rightleftarrows CaC_2, \quad (II)$$

combinations of these two reactions give the following:

$$CaO + 3C \rightleftarrows CaC_2 + CO \text{ and} \quad (III)$$

$$2CaO + CaC_2 \rightleftarrows 3Ca + 2CO. \quad (IV).$$

Which of these four reactions comes to the front depends on temperature, pressure, and on the speed at which the above equilibria have been established. The latter can be shifted into the direction of carbide formation by eliminating, from the system, the CO-gas and Ca-vapour formed in the reaction zone.

Temperature Conditions

According to the composition of the lime-carbon mixture, the eutectica formed during the carbide production lie at different temperature points. There is one eutectic point at 1,750° for a molten mixture containing 68 per cent. CaC_2, and another one at 1,800° C. for a mixture containing 35.6 per cent. CaC_2. Between these points there exists a maximum at 1,980° C. for a mixture with 52.5 per cent. calcium carbide content. It is at this maximum point that the existence of a compound $CaO.CaC_2$ has been proved. The above temperatures are approximately in the same range as those at which the reactions (II) and (III) start. But when the carbide-calcium oxide melt, which in the routine practice has a temperature of about two thousand °C., cools down and solidifies, the thermal character of the interactions (II) to (IV) are reputed to be changeable in a way as to re-disintegrate quickly parts of the carbide into CaO, C and CO. The higher the temperature the less calcium oxide is left in the carbide and the purer this becomes. Theoretical considerations lead to the assumption that at about 2,300° C. and ordinary pressure, pure carbide ought to be formed. Yet, practically, for the above reasons no pure product can thus be obtained.

Owing to the gases present in the reaction sphere, the equilibria (I) to (IV) are finally shifted to the wrong side, and only by completely new methods it has been recently possible to produce a very high-grade and nearly pure calcium carbide. One of the three methods so far known consists in re-pressing and re-melting ordinary technical carbide, from which all parts that have not become molten at 2,000° C. have been mechanically removed. In this way a 94 per cent. calcium carbide has been obtained. The second method, starting with chemically pure lime and carbon, takes advantage of the facts discussed above, namely, it eliminates all the gases by evacuating the reaction zone. The result has been a 98 per cent. carbide formed at a reaction temperature of 1,750° C.

The most interesting method, however, is based on the well-known reaction:

$$CaC_2 + N_2 \rightleftarrows CaCN_2 + C, \quad (V)$$

the formation of calcium cyanamide, the reversibility of which was first mentioned by N. Caro, in 1909. As a matter of fact, when this equilibrium is allowed to be shifted from right to left, the secondary reaction:

$$2CaCN_2 \rightarrow CaC_2 + Ca + N_2 \quad (VI)$$

may take place at the same time; but this, of course, does not affect the result, if only care has been taken to remove, together with the nitrogen, the Ca-vapour as well. As an example, if 2 parts of pure calcium cyanamide and 0.25 parts of pure carbon are heated in a high vacuum in a first stage below the eutectic point of the system CaC_2-$CaCN_2$, that is 1,130° C., and in a second stage at 1,250-1,300° C., a white calcium carbide of 99 per cent. CaC_2 content is obtainable.

Carbide Modifications

The investigation by X-rays of these differently produced high-grade carbides has shown them to be of a quite different crystalline structure. The Debye-Scherrer diagrams have proved that ordinary technical carbide is of a certain tetragonal structure and looks in thin layers under the microscope either red (α-carbide) or yellowish (β-carbide). Again, the 99 per cent. carbide made according to the above third method, gives another X-ray picture and may therefore be assumed to have a different structure (γ-carbide).

The specific gravity of β-carbide is about 2.5 per cent. less than that of α-carbide which may be due to a wider molecular lattice. In perfect concordance with this fact it has been found that the β-form interacts with nitrogen at a greater speed than the α-form, so that at equal temperatures more calcium cyanamide can be obtained from the former than can be from the latter. The α-carbide can be converted into the β-carbide, for instance, by addition of nitrogen, or a nitrogen containing compound, such as cyanamide of calcium. The two carbide forms are only stable within certain ranges of their respective nitrogen content which, thus, rules their crystalline structure. But if all the nitrogen has been eliminated then exclusively the γ-form is obtained. The -carbide appears not to be a uniform compound as well, but rather a mixed crystal containing small amounts of sulphur or sulphur compounds; it may only be an intermediate phase in the systems CaC_2- CaS, or CaC_2-Ca. This can be taken for granted as addition of, for instance, calcium sulphate to the γ- or β-form converts them into the α-form. On the other hand the α-form prevails as well if metallic calcium is in a surplus. Thus, only the γ-form can be considered as that representing the pure white calcium carbide. It has not been possible so far to produce an equally pure α- or β-carbide.

From the above facts some interesting considerations can be drawn. First of all, the best form for the cyanamide production would be the γ-form, but as this one is not easy to produce it may be advantageous to use for this purpose the β-carbide. To this must be applied the proposition to cool down molten carbide in an N_2- atmosphere, or to add calcium cyanamide to the carbide. In another terminology, one could also say calcium cyanamide acts as a catalyst and promotes the cyanamide formation from carbide and nitrogen.

Preparation from Cyanamide

On the other hand, as a pure carbide can be made from pure calcium cyanamide, it appears as if the whole carbide manufacture may, in the future, undergo a new turn. High-grade calcium cyanamide can now easily be prepared from ammonia, or ammonia forming reactants, and calcium carbonate (cf. THE CHEMICAL AGE, 1937, *36*, 339). With this product at hand the manufacture of calcium carbide from it could be achieved by heating in a vacuum. Thus, instead of

first making carbide from CaO and C and subsequently converting it into calcium cyanamide, the reverse process might be carried out, and this would not only yield a purer carbide than the routine process, but would also lower the production cost.

It has been found by Russian investigators that the manufacture of white cyanamide of calcium is cheaper than the production of the black product from carbide and nitrogen, and the difference in the cost may amount to approximately 20-25 per cent. The conversion of $CaCN_2$ into a high grade calcium carbide, at 1,800° C., must, of course, be less expensive and more economical than the production at 2,300° C. according to the highly endothermic routine method. Here the energy consumption is theoretically about 3,000 kWhs per 1,000 kgs of a 65-80 per cent. carbide. But, practically, the energy consumption rises with increased CaC_2 percentage in the melt owing to increased heat losses at the higher temperatures, which are necessary if the manufacture of a higher graded carbide is intended. Out of the 100 per cent. energy supply only about 70 per cent. is utilised for the carbide formation, the rest being consumed by heat losses and secondary reactions. From the economical standpoint it is therefore even more advantageous to manufacture, in the routine way, a 70 per cent. carbide than an 80 per cent. one. But, as has been indicated at the beginning, from the acetylene manufacturer's point of view a purer carbide is the more valuable product. The chemical foundations for the production of a high grade carbide, containing over 90 per cent. CaC_2, having been laid, it would probably depend only on apparatus for a new development to be put into practice.

Exhibition of American Chemicals and Chemical Plant

Exhibits at New York Exposition

AMERICAN industry's triumph through chemistry in a chemical age will be reflected by outstanding exhibits of leading manufacturers at the 16th Exposition of Chemical Industries to be held in New York, December 6-11, 1937. The fundamental relation of all industries to chemical processes and the advanced state of national recovery are combining to make this year's exposition the greatest one to date. Indications four months in advance of opening reveal a spirit of enthusiasm and comprehensive effort in exhibit planning on the part of many of the most representative concerns in the United States. A slogan contest, offering a first prize of $250 for the best description of the function and service of the chemical industries, is drawing additional national attention to the event.

Some of the Exhibits

A large manufacturer of explosives will emphasise research achievements, including a chlorinated rubber base designed to give longer life to paints, a low cost rosin for use in varnishes and insulating compounds, various synthetic resins, a liquid resin resistant to water and alkali, a liquid resin with plasticising and adhesive characteristics. The raw material basis for some of these products is tree stumps of southern pines, and cotton linters. Both raw materials, before research developed them, were worthless industrially and were of no value to farmers.

Caesium and rubidium salts, used in the manufacture of radio tubes and cathode ray tubes, will be the theme of one interesting display. Other products by the same exhibitor will be of interest to such widely diverse fields as dyestuffs, sugar refining and photography. Broadly indicated throughout the exposition is the fact that American industry can produce chemical rarities which heretofore were imported or made primarily as laboratory curiosities. Among the speciality chemicals to be exhibited are hydroxylamine sulphate, rubidium chloride, and other salts of rubidium; also amorphous boron. There will be shown an interesting series of chemicals whose special applications include the removal of colours, odours, and tastes. One of these products is designed to remove objectionable tastes from water, alcoholic beverages, fruit juices, and vegetable oils. Another related commodity is used to absorb food odours in refrigerators.

One exhibit will include 25 different gases used in chemical research, refrigeration, and industry. Another exhibit will be devoted to a display of lime products from deep mined stone, showing the results of chemical control in one of the most modern production plants.

Balancing the sections devoted to raw materials and chemical products will be the many displays presenting the machinery and equipment used in all manufacturing phases of the process industries. One classification of equipment relates to the heating, roasting, and calcining of solids; another will be concerned with the handling of liquids and gases, featuring pumps, compressors, blowers, fans, exhausters, pipes, ducts, conduits, valves, fittings, and tanks. Machinery designed to reduce various chemical products to varying degrees of particle size, will include crushers, grinders, sifters, vibratory screens, classifiers, separators, and ball and pebble mills. Other sections will cover filtration, evaporation, drying, and distillation.

One of the most interesting machine exhibits, having a relation to municipal and state sanitation problems, will be a miniature operating model of a mechanical thickener for removing 70,000 tons of silt per day from eight billion gallons of turbid Arizona river water. The actual installation employs 72 full-sized thickeners constituting the world's biggest river-desilting and water purification plant.

The practical use of titanium and zirconium in the chemical fields is relatively new, but one exhibit at the forthcoming exposition will be devoted to recent applications of the metals themselves, their salts, oxides, and silicates. Interesting applications of the products include opacifying vitreous enamels, manufacture of welding rod fluxes, and processing ceramic bodies and glaze work.

British Standards Institution

New Edition of Handbook

THE British Standards Institution has issued their half-yearly "Handbook," which includes the annual report, 1936-37 and indexed lists of British standard specifications to July, 1937.

The annual report for the year 1936-37 gives some indication of the enormous amount of detailed work undertaken by the technical committee's working under the three existing divisions of this national organisation, viz., building, chemical and engineering. The usual sections, showing the current lists of British standard specifications, the new and revised specifications recently issued, and those in course of preparation, are followed by a complete subject index. A further section is devoted to an index of the methods of tests contained in the various British standards.

In view of the large number of British standard specifications now available for all branches of industry, this half-yearly handbook and index is of increasing value to all users and should be in the hands of all technical and purchasing departments of public authorities and firms throughout industry. Copies of the new handbook are available from the British Standards Institution, Publications Department, 28 Victoria Street, London, S.W.1, price 1s. 4d., post free.

Further Notes on Textile Assistants

By
G. S. RANSHAW

IN a previous article (THE CHEMICAL AGE, August 14, 1937, page 133) a number of recent synthetic substances were described which have been evolved in order to substitute for ordinary soap in various textile operations where the older detergent exhibits certain deficiencies. Strictly speaking, these substances should not be classed as textile "assistants," since their function is the primary one of rendering a raw material, yarn or fabric free from dirt, oil or grease, and in a perfectly uniform condition. The term should really be limited to substances such as the wetting agents, where the task is the ancillary one of imparting to aqueous solutions an increased capacity for wetting material, although many substances have been developed which fulfil a dual rôle. The majority of the agents dealt with in the present paper have been evolved, however, for the performance of a specific task, be it of primary or secondary nature.

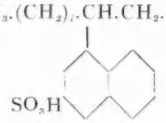
Alkyl Naphthalene Sulphonic Acids

The war, with its scarcity of fats necessary for soap-making, involved Germany in the search for substitute materials, and it was in the course of this search that the remarkable properties of the alkyl substituted naphthalene derivatives were discovered. At the time, however, their deficiency in washing power ensured them only a limited use, but post-war work has resulted in the development of several products whose names have become household words in the industry for surprising *wetting power*, outstanding acid resistance, and very marked resistance to lime-soap formation.

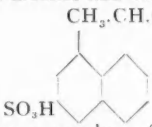
These products were originally manufactured by treating a fatty acid with sulphuric acid in presence of an aromatic hydrocarbon. The sulphonating agent first attacks the double bond, as in the case of turkey red oil production; on raising the sulphonating conditions it is replaced by the hydrocarbon, to which it attaches itself:—

Oleic Acid $\}$ $CH_3.(CH_2)_7.CH:CH.(CH_2)_7.COOH$

Alkyl Naphthalene Sulphonic Acid $\}$ $CH_3.(CH_2)_x.CH.CH_2.(CH_2)_7.COOH$



Such bodies have no real textile significance, although their wetting powers are somewhat superior to those of the pure sulphonated oils and sulphonic acid esters, especially in alkaline solution. Investigation of the effect of the *type* of aliphatic residue introduced into the hydrocarbon ring, however, showed that the most favourable combination was an aromatic sulphonic acid to which an aliphatic residue of the length of propyl alcohol had been added:—



The result was a number of exceptionally good wetting agents, owing to the preponderance of purely electrolytic properties, but the fatty character of the long chain is retained even to a lesser degree than in the sulphonated oils. To this, and to their relatively low molecular structure may be traced their lack of emulsifying power, and hence their failure as detergents. They have proved their value, over a wide range of temperature, however, as wetting agents in the sizing operation prior to bleaching, in the bowking and bleaching processes, and in the various dyeing operations—particularly in machine dyeing and with fabrics composed of highly twisted yarns which are otherwise difficult to wet out.

Simple variations, moreover, have corrected their deficiency as emulsifiers. Perminal EMF of the I.C.I., for instance, marked by specially good emulsifying power, is an alkyl sulphonic acid combined with protein substances. Other compounds add protective colloids such as glue or gelatine, while a number of commercial products consist of alkyl naphthalene sulphonic acid in conjunction with any bodies with more emphatic carbophile character, such as soaps, sulphonated oils, fatty alcohols, proteins, sulphite waste liquor, etc. These bodies are used as emulsifiers of the mineral, vegetable and animal solid or liquid fats, oils and waxes, or the higher hydrocarbons, and constitute the materials used for the lubrication of wool and rayon, the sizing of silk, and the finishing of various textiles to give softness and draping qualities.

Mercerising Assistants

The mercerising assistants, of which there are a number, again depend for their utility on intensive wetting power. Originally the mercerising of cotton had to be preceded by a severe boiling process (kier boil) whose object was to remove the sizes, natural waxes, dirt and oil from the yarn or fabric, and at the same time to make it uniformly absorbent for the mercerising liquor. The kiering operation at best, however, is laborious and wasteful, and can lead to serious damage to the cloth in unskilled hands. Modern, strongly active mercerising assistants now make it possible to proceed direct to the mercerisation of the goods as they come from the mill; in them, the specific wetting agent, which is itself insoluble in the concentrated mercerising liquor, is made soluble by the incorporation of, say, methylhexalin. The basis of most of these mercerising assistants consists of phenols and cresols, both surface active substances themselves, and the most recent types have been given a polar sulpho-group also. Perminal MERC, companion to Perminal EML, consists of a mixture of cresol, pine oil and olein, while Mercerol C of the Sandoz concern consists of cresol and cyclohexanol.

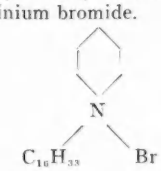
Fixing Agents

Some 13 years ago, the Society for Chemical Industry in Basle patented a method of producing the diethylaminoethylamide of oleic acid, and thereby added to the number of then known textile assistants a new and interesting class of bodies, similar in certain respects to the quaternary ammonium salts investigated earlier by Reychler and named by him "inverted soaps." The new compounds, produced synthetically, were suitable in the first place for increasing the fastness to water, and in some cases the fastness to washing, of *substantive* or *direct* dyestuffs; they are marketed as the hydrochloride and acetate having the formulæ:—

$C_{17}H_{33}.CO.NH.C_2H_4.N(C_2H_5)_2.HCl$

$C_{17}H_{33}CO.NH.C_2H_4.N(C_2H_5)_2.CH_3COOH$

A later English product of similar properties is a representative of the high-molecular cyclic-amines obtained by heating pyridine with suitable high-molecular chlorides, bromides or sulphates, such as cetyl bromide or dodecyl sulphate. A pyridinium derivative with quinquevalent nitrogen results, a popular product (Fixanol) of the I.C.I. being probably based on cetyl pyridinium bromide.



The principal use to which these agents have been put is in the after-treatment of direct dyeings, and they have made it possible so to treat these that they will even withstand an acid cross-dyeing process, in addition to acquiring a much-in-

creased fastness to water, perspiration and wet rubbing. This effect, and other interesting ones which are in course of development, is due to the fact that all these substances are *cation-active*.

With the majority of textile assistants which depend for their utility on strongly marked surface-active properties, the fatty chain responsible for the surface activity is carried in the *anion*, as will be seen from the formula for a typical product such as sodium oleate, or soap, which dissociates in aqueous solution into colloidal anions and simple cations :—

$$[CH_3.(CH_2)_7.HC:CH.(CH_2)_7.COO]^-Na^+$$

A typical cation-active body such as dodecyltrimethylamine bromide, however, dissociates in the reverse manner :—

$$C_{12}H_{23}.N\equiv(CH_3)_3 \rightleftarrows [C_{12}H_{23}N\equiv(CH_3)_3]^+Br^-$$

Here, as in the fixing agents previously mentioned, the cation is the colloidal, effective part, and the action of these products as fixing agents for substantive dyestuffs may now be explained as a process whereby a salt is formed between the dyestuff present in the fibre and the base represented by the particular cation-active product used. On a purely chemical basis the substantive dyestuff may be imagined to possess the formula :

$$R.SO_3Na$$

which dissociates into positive sodium ions and negative comprising the $R.SO_3$-group, as follows :—

$$R.SO_3Na \rightleftarrows [R.SO_3]^-Na^+$$

The assistant, or fixing agent, however, may be characterised by the formula :

$$R_1.NH_2.HCl$$

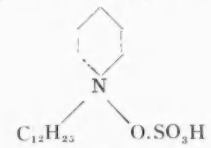
which dissociates according to the equation :—

$$R_1NH_2.HCl \rightleftarrows [R_1.NH_2.H]^+Cl^-$$

Just as a negative and a positive charge neutralise one another, so the dyestuff anion and the cation of the assistant can be said to neutralise one another, *i.e.*, to form a salt which is precipitated on the fibre :—

$$[R\,SO_3]^- + Na^+ + [R_1NH_2H]^+ + [Cl]^- \rightleftarrows [RSO_3.NH_2HR^1]^+ + Na^+ + Cl^-$$

The cation-activity of the alkyl pyridinium and related compounds has been put to other uses, however, than the fixation of substantive dyeings. Some of these foreshadow developments of great interest to the textile trade. The positively charged colloidal ions of the cation-active assistant, for instance, cannot disperse dirt, which for the most part is negatively charged; in fact they influence its precipitation on the fibre. In some cases, however, it is desirable to deposit a finely dispersed substance on the fibre, and here the cation-active substance finds an application. The property is used, for instance in the patents of the Böhme concern for the delustring of rayon piece-goods, pigments such as zinc or barium sulphate being deposited on the rayon filaments from a bath containing dodecylpyridinium bisulphate :



The same train of thought has led to the production of agents which utilise a cation-active substance to "break" a fine emulsion. The usual emulsions of metallic salts, *e.g.* aluminium, used in waterproofing, are insensible to precipitation by this means, the aluminium ions being also cations; but paraffin emulsions can be so broken, and the modern one-bath porous impregnation process may be carried out in this way.

Finally, the cation-active colloid electrolyte has found an important use in the *stripping* of certain dyestuffs from fibres where the fabric has been wrongly or imperfectly dyed in the first place. The products here are quaternary ammonium derivatives or derivatives of pyridine, cetyl trimethyl ammonium bromide and octodecyl pyridinium bromide, and are capable of stripping vat colours in presence of hydrosulphite and soda.

Only a few of the vast number of compounds which have been developed for specialised uses in the textile trade have been mentioned, the chosen few being representative of various classes, each comprising a few tried and tested proprietory substances, and each fulfilling a desirable purpose. New products, combinations, and variations of old ones follow one another so rapidly, however, that the chemist has difficulty in keeping up to date. Of these a great number are redundant or worthless, but the residue consists of products which have proved a real boon to the textile chemist anxious to improve his goods, operate more economically, or secure new and better effects.

Identification of Azo Dyestuffs

Application of Catalytic Reduction

THE utility of the Raney nickel catalyst in the reduction of some common azo compounds has been investigated by Whitmore and Revukas (*J. Amer. Chem. Soc.*, 1937, *59*, 1,500). It is pointed out that the large number of azo compounds which constitute the industrially important azo dyestuffs warrant special attention, since there is an urgent need of a simple, yet precise, procedure for their analysis and estimation. The analysis of these types is best effected by reduction and recognition of the basic forms produced. This reduction is normally carried out with stannous chloride, sodium hyposulphate, etc., which not only contaminate but make the isolation of the scission products more difficult.

The present investigation, however, is the first of a series which will demonstrate the practicability of the Raney nickel catalyst for the hydrogenation of azo and substituted azo compounds at room temperature and from 1 to 4 atmospheres absolute pressure. The Raney nickel catalyst was prepared according to the method of Covert and Adkins (*J. Amer. Chem. Soc.*, 1932, *54*, 4,116).

That quantity of azo compound which was *completely* soluble in 125 ml. of the solvent was shaken with 3-5 g. of the Raney nickel catalyst per 0.01 mole of the substance. The hydrogenation was carried out either at 45 lb. (3 atm.) gauge pressure and room temperature using the Burgess-Parr apparatus, or at one atmosphere absolute pressure, in which case the hydrogen was supplied from a 200-ml. burette and the Burgess-Parr agitation equipment was used. When no further absorption of hydrogen occurred, the contents of the reaction vessel were filtered to remove the spent catalyst, and one of the reaction products was extracted with ethyl ether, and the other was precipitated out by introducing hydrogen chloride gas into the filtrate. The volume of hydrogen absorbed at atmospheric pressure corresponds to the percentage of hydrogenation and a quantitative indication of the purity of the dye or azo compound.

Catalytic reduction with the Raney nickel is of practical value in the analysis of the water-soluble sulphonated azo dyes, as well as the other azo compounds mentioned in the paper, *i.e. p* azobenzene, methyl orange, methyl red, orange I, sunset yellow, amaranth, ponceau 3R, and tartrazine.

Letters to the Editor

Holidays with Pay

SIR,—For many months I have been collecting data regarding holidays with pay. I should be very glad to know of any firm connected with the chemical industry that gives holidays with pay (and/or any other concessions to their workers). Could any employers of labour help me by sending information? All letters will be acknowledged.—Yours faithfully,

JAMES WHITTAKER.

180 Fleet Street,
London, E.C.4.

Care in Handling and Storage of Explosives

Satisfactory Report of His Majesty's Inspectors

OWING to increase of work in other directions the number of visits of inspection to factories, magazines and local authorities was again below normal, states the 61st annual report of H.M. Inspectors of Explosives for 1936 (Stationery Office, price 9d.)

Two Outstanding Dangers

Attention is drawn to two dangers in particular which continue to cause unnecessary accidents of a particularly distressing kind. The first is the use of petrol for cleaning and other general domestic purposes, in which connection 13 accidents have been reported, causing three deaths and injuries to 10 persons. The other source of too frequent accident is the amateur manufacture of firework compositions containing chlorate and sulphur or chlorate and phosphorus. The danger with these mixtures is not merely their sensitiveness to friction but the quickness and power of the explosion. Gunpowder exploding by accident, when, for instance, being ground by pestle and mortar, will probably do no more than scorch the face and singe the hair of the amateur operator, but a chlorate and phosphorus or sulphur mixture will explode with detonative violence smashing up the mortar and blowing off the fingers or hand or perhaps causing fatal injuries to the operator. The inspectors have again found it necessary to send out a circular to manufacturers of chemical sets warning them against including these dangerous substances in their sets. Owing to the great dangers of these compositions they are prohibited by Orders in Council.

The subject of the conveyance by road of dangerous substances such as corrosive acids and inflammable liquids other than petroleum spirit, which at present do not come within the sphere of any specific Act, has been mentioned in recent annual reports. It is again dealt with in the present report, and the Inspectors of Explosives acknowledge the help given by the Railway Clearing House, the Association of British Chemical Manufacturers and other bodies in the preparation of the draft regulations.

Cylinders for compressed gases is another subject that has lain comparatively dormant for some years. Recently there has been a demand for high pressure cylinders lighter in weight than the present regulation cylinders necessitating stronger types of steel. To introduce the change two considerations must be borne in mind—assurance that the new type of cylinder can be manufactured in quantity to meet all the safety requirements of the specification: and the consideration that the firms which have had to build up large stocks of cylinders for their businesses, relying on the stability of Home Office Regulations, must be given reasonable warning of any drastic change.

Buildings and Stores

In the annual report for 1935 an unsatisfactory feature of many working buildings in firework factories was described, namely, the nature of the partitions in compartmented buildings which were not flash proof. Arrangements were made with the manufacturers to remedy the defects by covering the partitions to render them both proof against the ingress of explosive dust and flash proof. This has now been accomplished.

During the year as many opportunities as possible but actually few in number have been taken to visit local authorities and to inspect, with the appointed officer, stores and registered premises. In the majority of cases these were found in good order, but certain irregularities were noticed. Excesses in quantities of explosives allowed were found in both stores and registered premises, and detonators were found stored with high explosives. Some wet explosive found was ordered to be destroyed. Local authorities are urged to obtain for the use of their officers Summary No. IV relating to stores for gunpowder or mixed explosives (price 4d.) and Summary No. VI relating to premises registered for gunpowder or mixed explosives (price 3d.). These are obtainable from H.M. Stationery Office.

This year, in accidents in manufacture, there have been three deaths and injuries to 21 persons. The number of accidents shows some increase. This is partly accounted for by an increase in production of certain explosives which are known to be liable to ignite during manufacture; but, in consequence of the precautions taken to prevent injury to personnel and to restrict damage to a minimum, the increased number of accidents has not been accompanied by any serious increase in the number of casualties. The latter figure is slightly above the average of the last ten years. It might, however, be pointed out that the number given as injured included every case of trivial injury. The number of persons seriously injured is small. There were no accidents during the manufacture of nitro-glycerine.

Accident in Packing Collodion Cotton

A serious fire occurred during the packing of collodion cotton damped with toluene which resulted in two workmen receiving very serious burns from which they subsequently died. Collodion cotton when damped with certain liquids ceases to be explosive and some time ago it was agreed that when it was damped with not less than 25 per cent. by weight of toluene it could be regarded as being outside the provisions of the Explosives Act, 1875. This accident confirms that collodion cotton so damped will not explode in bulk, but it is possible that the original ignition was due to impact or friction and therefore the conditions of exemption of collodion cotton, when damped with spirits, from the provisions of the Explosives Act are under review. The accident is an important one because great quantities of damped collodion cotton are handled in the many factories in which it is converted into varnishes, celluloid or other products.

Accidents in firework factories have been few and, with one exception, of a minor character only. In this one case an ignition occurred when the piece of curved wood was being attached to a tourbillion. A copper nail is used for this purpose. The cause of the ignition was due to the centre clay plug being out of place and in consequence the nail was driven into the explosive. Other fireworks ignited and two men received burns. The resulting fire caused undue damage to the compartment on account of a hitch in getting out the fire hose.

Illegal Manufacture

Several cases of illegal manufacture have been brought to notice during the year, due in each case to an accident having taken place.

The occupier of registered premises was injured when a fire occurred as he was tying up a bundle of fireworks. The cause of the ignition was not ascertained. A quantity of magnesium and aluminium powders, plaster of paris, a black explosive powder and cardboard tubes were found on the premises and it must be presumed that the occupier had manufactured fireworks illegally or proposed to do so. The occupier received a warning.

Chlorate-Phosphorus and -Sulphur Mixtures

There have unfortunately been four further accidents this year, and possibly others unreported, in connection with chlorate-phosphorus and chlorate-sulphur mixtures. Of these accidents two in particular illustrate the extreme sensitivity of these mixtures. In the first case a master at an elementary school mixed potassium chlorate and antimony

sulphide in an envelope. He then added phosphorus and while he was smoothing it over with a stick of chalk the explosion occurred. The master received severe injuries and it was found necessary to amputate three fingers. The science text books in use at the school were obtained and it was found that they gave details about these mixtures and also suggested other experiments with explosives. The matter was taken up with the publishers and also with the Board of Education. In the other case a boy had mixed phosphorus with potassium perchlorate and had placed it in a bottle. Whilst he was in the act of screwing on the metal cap an explosion occurred causing injuries to his face, hands and abdomen.

Another accident resulted in a boy of 13 receiving injuries. In this case about an ounce of both potassium chlorate and sulphur was actually mixed by a qualified chemist, before he handed it to the boy. The chemist was subsequently prosecuted and fined. A more serious accident resulted in three boys being injured, two very seriously. In this case both phosphorus and sulphur were being mixed with potassium chlorate when the explosion occurred. One of the boys possessed a chemical set, but it is possible that the sulphur and potassium chlorate were bought separately. The matter was, however, taken up with the manufacturers of the set who agreed to exclude potassium chlorate in future.

A serious explosion resulting in the loss of five lives occurred at the Research Department, Royal Arsenal, Woolwich, on July 8, 1936, and was the subject of an official inquiry by the War Office. Briefly—the explosion occurred during the experimental filling of a large shell. The process had been worked out in detail and was all but ready to be handed over to the filling factories for filling shell for supply. It was on this account that an officer from the Admiralty and more persons than absolutely necessary for the working of the process were present. The cause was not definitely ascertained but was thought to be due to a number of abnormal occurrences, combined with friction in certain parts of the filling machine leading to overheating of the explosive.

The Chief Inspector of Explosives for India reports two accidents of special interest. One occurred in a firework factory, and investigation showed that fireworks were being made, using sulphur-chlorate mixtures. The second occurred on premises where gunpowder and firework composition were stored. The cause of the explosion was not determined with certainty, but it may have been due to spontaneous ignition of an aluminium-chlorate mixture. One person was killed and seven injured. Had the storage premises observed the requisite distance from a public thoroughfare, it is probable that no one would have been injured. This accident emphasises the necessity for ensuring that danger areas round magazines are kept clear.

Storage of Petroleum

There were six accidents reported under the heading of repairs to motor vehicles and storage plant in connection with petroleum. For one of these a report was duly published in accordance with Section 14 of the Petroleum (Consolidation) Act, 1928, and is on sale at H.M. Stationery Office. In this case it seems quite possible that the explosion was caused by the spontaneous ignition of iron sulphide produced by biological action, as both iron sulphide and sulphate reducing bacteria were found in the tank. The explosion occurred whilst three men were on the roof of the tank testing for leaks with soapy water. In order to carry out this test the tank was put under 4 in. of water pressure. This pressure was applied by blowing air through the main pipe line to the tank. This pipe contained petroleum spirit and thus provided the explosive mixture in the tank. A recommendation was made in the report that the question of the biological production of iron sulphide and possibly phosphoretted hydrogen in petroleum tanks, and the conditions of spontaneous ignition by this means should be investigated.

During the year covered by the present report steps have been taken to amend the Order in Council No. 22 dated June 18, 1934, to permit the manufacture or keeping of acetylene up to a pressure not exceeding twenty-two pounds per sq. in. above that of the atmosphere provided that the manufacture and keeping is carried out only on such premises and under such conditions as may be approved by the Secretary of State. This alteration has been effected by the repeal of the Order in Council No. 22 and the publication of a new Order in Council embodying the new increase in pressure.

There were only two accidents reported in connection with acetylene generators, but it is highly probable that more occurred. One is interesting from the point of view of the conditions under which generators are kept and operated. In this case apparently the water in the generator was only changed once weekly, and gas was, it seems, generated up to a gauge pressure of 15 lb. per sq. in. (6 lb. above the legal limit). The plug in the hydraulic valve attached to the generator was firmly fixed, and it looked as if it had not been used at all. It is quite possible that there was no water in it. It was fortunate that no injuries were caused by this accident as the explosion was violent. The shed in which the generator was housed was shattered, and the concrete floor broken, the steel uprights were knocked out of the floor and the top and bottom of the generator were blown out. The generator came to rest at an angle of about 45° bottom upwards. The owners were unaware, at the time of the accident, that a licence under the Petroleum (Consolidation) Act, 1928, was necessary for the storage of calcium carbide. Another accident illustrates the importance of keeping all apparatus liable to give rise to sparking as far away as possible from places where acetylene is likely to be present.

Light-weight Gas Cylinders

Mention is made of the contemplated change-over by degrees to light weight high pressure cylinders for oxygen and other permanent gases. The conditions required by the authorities and contained in a circular letter are that a firm wishing to introduce such cylinders may apply to put into use a number not exceeding 3,000 over a trial period of three years. The procedure will be in the first place for samples of representative cylinders from each source of supply to be selected for test and sent to the National Physical Laboratory, to ensure that the make of cylinder is satisfactory. Destructive tests also of further samples taken from cylinders in use will be made each year to determine whether the cylinders are behaving satisfactorily.

As regards liquefiable gases—with a view to accumulating the necessary information to enable the Department of Scientific and Industrial Research to advise the Home Office in regard to regulations which are contemplated to control the conveyance by road, the Gas Cylinders and Containers Committee have arranged a comprehensive programme for experimental work. The programme includes research work in connection with cylinders for "permanent" gases also. In the meanwhile, in order not to delay industrial development, arrangements have now been made where necessary for certain containers for liquefiable gases to be tested at the National Physical Laboratory with a view to advising firms in regard to their suitability.

Misuse of Oxygen

During the year several accidents have been reported which are of special interest. The dangers of the use of oil or grease in connection with oxygen are well known and every oxygen cylinder has a label on which is written the warning, "It is dangerous to use oil or grease." Two accidents have been reported which were due to the use of compressed oxygen by mistake instead of compressed air.

The first accident occurred in a factory where an oil purifying plant is in use. By mistake a cylinder of oxygen was used instead of compressed air. As the oil in the plant had previously been heated to a temperature of 550° F. it is not

surprising that an explosion occurred when oxygen was admitted. Four men were injured. In the second accident fuel oil storage tanks were being tested. Again it was a case of compressed oxygen being used by mistake instead of compressed air. A workman then entered the tank carrying a lighted candle and there was a violent "combustion" and the man was severely burned.

It would appear that the warning label affixed to the oxygen cylinder does not entirely fulfil its purpose, and as in other years similar accidents have happened, the matter was taken up with the British Oxygen Company with a view to the substitution of a clearer warning label. This has now been done and the new label reads as follows:—"Oxygen. It is dangerous to use oil or grease. Do not use oxygen instead of compressed air. Open valve slowly; shut off after use."

An appendix relates to chemical work and gives reasons for adverse reports. Low heat tests (9) were mostly owing to insufficiently purified nitro-compounds. There has been an unusual number of these low heat tests this year and the question requires looking into carefully by the trade. Wrong composition (6) mainly concerned excess of moisture..

SUMMARY SHOWING ACCIDENTS IN MANUFACTURE, KEEPING, CONVEYANCE, AND USE OF EXPLOSIVES, IN EACH OF THE LAST TEN YEARS.

Year.	Manufacture.			Keeping.			Conveyance.			Use of Miscellaneous.			Total.		
	Accidents.	Persons Killed.	Persons Injured.	Accidents.	Persons Killed.	Persons Injured.	Accidents.	Persons Killed.	Persons Injured.	Accidents.	Persons Killed.	Persons Injured.	Accidents.	Persons Killed.	Persons Injured.
1936 ..	73	3	21	4	–	1	–	–	–	240	22	251	317	25	273
1935 ..	52	5	19	–	–	–	–	–	–	265	22	283	317	27	302
1934 ..	38	–	14	2	–	2	1	–	1	233	21	250	274	21	267
1933 ..	41	2	16	1	1	–	1	–	–	201	33	202	244	36	218
1932 ..	45	4	10	–	–	–	–	–	–	227	31	241	272	35	251
1931 ..	22	2	10	1	–	1	1	–	–	225	24	241	249	26	252
1930 ..	40	1	15	1	–	–	–	–	–	289	31	316	330	32	331
1929 ..	60	–	20	–	–	–	1	–	1	283	38	295	344	38	316
1928 ..	94	10	17	2	–	4	–	–	–	270	25	280	366	35	301
1927 ..	56	6	14	–	–	–	1	–	2	310	34	349	367	40	365
Average for 10 years 1927-36.	52.1	3.3	15.6	1.1	.1	.8	.5		.4	254.3	28.1	270.8	308.0	31.5	287.6

Synthetic Nitrogen Fertilisers

New Company to Start Manufacture

THE production of fertilisers from atmospheric nitrogen is to be undertaken by Nitrogen Fertilisers, Ltd. This new company, with a capital of £10,000, will enter into a trading agreement with Fison, Packard and Prentice, Ltd., of Ipswich, and the West Norfolk Farmers' Manure and Chemical Co-operative Co., Ltd., of King's Lynn, and carry out research on the fixation of atmospheric nitrogen and manufacture derivative compounds on a commercial scale. Six of the first directors of Nitrogen Fertilisers, Ltd., are to be appointed by Fison, Packard and Prentice, and three are to be appointed by the West Norfolk Farmers' Manure and Chemical Co-operative Co. At their works at King's Lynn, the latter company recently put into operation a large sulphuric acid plant of the lead chamber type, which was designed and erected by the Moritz Chemical Engineering Co., Ltd., of London.

United States and Canada

Effect of Reciprocal Trade Agreement

SUBSTANTIAL increases in the chemical foreign trade of the United States since the series of reciprocal trade agreements with foreign countries went into effect, are cited as an indication of the "stimulating effect" of the agreement in a report by Mr. Otto Wilson, statistician to the American Chemical Society.

By checking import and export figures for 1936 against earlier figures, Mr. Wilson finds a starting point for judging the results of mutual tariff concessions. Trade agreements alone, he points out, are not responsible for the changes; continued business recovery, political crises, rearmament programmes and comparative stability in exchange have also affected the trade. The trade returns, nevertheless, do have significance in adjudging the effects of the agreements, most of which have been in operation for at least a year, he says.

Imports to the United States from Canada in 1936 were higher by 32 per cent. than in the preceding year; exports by nearly 20 per cent. Trade in both directions was about twice as great in value as it had been three years before. With the trade agreement with Canada going into effect January 1, 1936, there has been one full calendar year in which to test its provisions. Canadian imports from the United States, according to Canada's own figures, showed an 18 per cent. increase, while the imports from all other countries increased only 1. per cent. On the other hand, the 32 per cent. gain in United States imports from Canada compared with a gain of only 17 per cent. in imports from all other countries.

Liquid Hydrogen

Production without Expensive Equipment

A HYDROGEN liquefying system which depends upon commercial electrolytic hydrogen as the source of high pressure gas and which involves the use of metal dewars, improved means of thermal isolation and heat exchange, and a means for producing lower fore-temperatures in the form of a charcoal desorption unit, is described by F. G. Keyes, H. T. Gerry and J. F. G. Hicks, junr. (*J. Amer. Chem. Soc.*, 1937, *59*, 1,426).

The paper sketches briefly the theory of liquefaction by the use of the Joule-Thomson effect and describes some improvements in the interchanger-liquefier together with a proposed procedure for lowering the fore-temperature of hydrogen entering the liquefier. It is shown that it is possible to produce liquid hydrogen wherever tanks of compressed hydrogen are available by using equipment which can be fabricated inexpensively. A source of liquid air, preferably liquid nitrogen, is of course required.

Method of Operation

Prior to the admission of any hydrogen to the system, air is removed by flushing with nitrogen at room temperature. Both the high and low pressure systems are next evacuated to 0.1 mm. pressure, and flushed with the commercial hydrogen, and a pressure slightly above atmospheric is maintained during the cooling of the liquefier. The precoolers are then cooled to operating temperature. The initial flow of hydrogen is at the rate of 95 litres per minute, and the flow is controlled by means of the expansion valve. Hydrogen is then produced at the rate of 4 litres per hour at 135 atm. to 1 litre per hour at 20 atm.

The course of the liquefaction is followed by means of thermocouples, and the process is halted to replenish the pumped precooler dewar when the hydrogen fore-temperature rises to 60° K. Either during or after liquefaction, liquid hydrogen may be siphoned into a transfer dewar and transported to the cryostat. The dewar of liquid hydrogen is carried on a copper truck which is in good electrical contact with its copper tyred wheels. Likewise the liquefier and cryostats are all electrically grounded.

With the entire liquefying system at room temperature, a supply of 25 litres of liquid nitrogen will suffice to produce 5 litres of liquid hydrogen; 1.3 litres of liquid hydrogen are obtained from each cylinder containing 200 cu. ft. of hydrogen gas. When the system is not in use, hydrogen slightly above atmospheric pressure is maintained in the lines. The liquefier described by the authors has been installed for a period of eighteen months, during which time it has produced some 50 litres of liquid as required.

The Chemical Age Lawn Tennis Tournament

Competitors in the Finals Next Saturday

THE two remaining semi-finals matches in the singles of THE CHEMICAL AGE Lawn Tennis Tournament, the finals of which are to be played next Saturday, September 4, have now been played with the following results:—

R. M. O. Williams (Imperial Chemical Industries, Ltd.), beat C. C. Gough (Lever Bros., Ltd.), 8-6, 6-4; and L. F. Grape (Borax Consolidated, Ltd.), beat A. H. Tickner (British Celanese, Ltd.), 6-1, 6-3.

The finalists, therefore, are as follows:—

SINGLES

R. M. O. Williams (Imperial Chemical Industries Ltd.) *v.* **L. F. Grape** (Borax Consolidated, Ltd.)

DOUBLES

A. E. C. Willshere and **L. F. Grape** (Borax Consolidated, Ltd.) *v.* **G. W. Hole** (Anglo-Saxon Petroleum Co., Ltd.), and **C. G. Smith** (Shell-Mex and B.P.-Ltd.

R. M. O. Williams, who enters the singles finals for the first time by eliminating C. C. Gough, the holder, meets L. F. Grape, who also figures in the doubles finals. A. E. C. Willshere and L. F. Grape were joint winners of the doubles event last year, the final being unfinished owing to failing light. They were also the runners-up in the doubles in 1935.

By the kindness of Mr. Victor Blagden, chairman of Victor Blagden and Co., Ltd., the finals will be played at White Cottage, Sandy Lane, Oxted, Surrey, at 3 p.m. promptly. A most convenient train leaves Victoria station at 1.28 p.m. (London Bridge 1.38 p.m.), arriving at Oxted at 2.28 p.m. A 'bus leaves Oxted station at 2.35 p.m. for the Bell Inn, Old Oxted (about one mile). Sandy Lane is on the right of the inn, and White Cottage is about 300 yards up Sandy Lane on the right-hand side.

At the conclusion of play, Mr. John Benn, a director of Benn Brothers, Ltd., the proprietors of THE CHEMICAL AGE, will present the trophies. THE CHEMICAL AGE silver challenge cups will be presented to the winners of the singles and doubles respectively. Silver statuettes for the winners have been kindly given by Thomas Hill-Jones, Ltd., and similar statuettes for the runners-up by Mr. Lloyd Willey, a director of the latter company.

Carbon Black Manufacture

Utilisation of Anthracene

CONTINUING its efforts towards securing independence in its carbon black requirements, Germany has turned to anthracene, a coal-tar derivative, as a raw material.

About 18 months ago Germany began the production of blacks from naphthalene, and according to reports was successful in synthesising a product equal to the best grades of American carbon black. To ensure raw materials for the new industry the government placed an embargo on certain grades of naphthalene and at the same time passed legislation requiring the use of the new product, particularly in the manufacture of automobile tyres. In 1936 it was reported that Germany was producing naphthalene black at the rate of 12,000 metric tons per annum and that the domestic product was rapidly replacing imports of gas blacks. It now appears that Germany is finding the use of naphthalene too expensive, owing to its scarcity and the heavy demand from other industries throughout the country, and is turning to anthracene as a substitute.

It is not at present known to what extent anthracene is being used in the manufacture of blacks in Germany, but it appears that one plant, Russwerke Dortmund, and a group of rubber tyre manufacturers will utilise the process.

Partial Drying of Gases

Towers Packed with Calcium Chloride

THE use of calcium chloride for the partial drying of gases industrially is described in a communication from the research laboratory of the Société Solvay (*Chim. et Ind.*, 1937, *38*, 1, 3-12). Complete drying is not aimed at, but only the reduction of the percentage humidity to that of a saturated solution of calcium chloride.

The moist gas (air) is injected into a tower packed with 73-75 per cent. calcium chloride in pieces 2.5 to 5 cm. diameter, resting on a wooden grille covered with a metallic net. Absorption of water, which is an exothermic reaction, so that the temperature of the air rises during drying, occurs principally in a small layer of chloride at the bottom of the pile, whilst further up a saturated solution of calcium chloride is formed on the surface of the lumps, trickles down, and is siphoned off at the bottom. Owing to the dissolution of the calcium chloride the process obviously cannot be operated continuously, but must be interrupted for recharging. Hygrometric equilibrum between the calcium chloride solution and the air is reached when the rate of passage lies between 700 and 3,500 kg. (dry basis) pr hour per sq. metre of cross section of tower.

Development of Industry

A Growing Reliance on Chemical Science

GROWING reliance on chemical science to develop industry is evident in Europe, reports Dr. H. E. Howe, editor of *Industrial and Engineering Chemistry*, who has just returned to the United States from a trip to England and the Continent. Germany, Dr. Howe found, is making notable advances in the production of synthetic products from domestic raw materials. Czechoslovakia, with the aid of Belgian capital, is making unusual efforts to expand its chemical industry. Labour unrest has interfered with normal industrial progress in France, while in Great Britain there is "orderly chemical development."

The programme to make Germany independent of imported products seems to depend to a large degree upon the ability to make what is needed from water, air, limestone, coal, and casein. Some of the products produced are already well known in industry. Others displayed for the first time at the exposition at Franfort possess great merit, and show the result of applying great ingenuity. One is a new insulating material made by the polymerisation of foam from a synthetic resin. Another is the "Zell Wolle" or wool substitute made from wood cellulose. A third is the synthetic petroleum, first made by the Bergius process and now also by the Fischer process, and a fourth is the "Buna" rubber produced now on a large scale.

On one border of Germany we find Czechoslovakia, enterprising and active, and with a great chemical works at Aussig, recently modernised, it is understood, with the help of Belgian capital. The cost of raw materials may considerably restrict competition of Czechoslovakian chemical plants for some time, but it is a development with which we should keep in touch. On another border lies France, greatly disturbed economically, if not politically, and with industries left uncertain because of the present attitude of labour, the disputes over hours and wages, and strikes of all kinds.

New Technical Books

STEELS FOR THE USER. By R. T. Rolfe. pp. 280. London: Chapman and Hall, Ltd. 21s.

The basis of the present volume was a series of articles which appeared in *The Iron and Steel Industry*, 1934-37. Republication has permitted revision, where necessary, and the inclusion of much additional matter and many figures, which should add materially to the value of the work. It is pointed out that there are already many books on steel, from general text-books, written for the student, to specialist books on heat treatment and other branches of production. In consequence, the engineer and other steel users must pick their way through a multitude of volumes in the endeavour to construct satisfactory fabric of knowledge which will enable him to exercise discrimination and select with more assurance the various steels which are available for different purposes. The present book, therefore, attempts to bridge this gap between science and practice for carbon steels in industry. Alloy steels are not specifically dealt with, although they are frequently discussed, in cases where carbon steels do not satisfactorily perform the duty. While the scientific aspects of the various processes are all comprehensively treated, these are always illustrated by ample data and examples from actual service. The book is, definitely, a practical one, scientifically explained, rather than a theoretical one with practical examples. It is hoped that the book will be generally welcomed by users, largely because it is a record of work done (in one section of an engineering works laboratory) to obtain information which was lacking, but which was essential for the proper control of production.

ORGANIC SYNTHESES. Vol. XVII. L. F. Fieser, Editor-in-Chief. pp. 112. London: Chapman and Hall, Ltd. 8s. 6d.

This annual publication of satisfactory methods for the preparation of organic chemicals is now in its 17th year. The present issue contains detailed procedure for thirty preparations. There is an appendix giving later references to preparations in preceding volumes and all additions and corrections for the preceding volumes.

PLASTIC GUIDE BOOK. By G. Kranzlein and R. Lepsius. Published at the Plastics Exhibition, 1937, of Achema VIII. pp. 140. Verlag Chemie, Berlin. R.M. 150.

At the plastics exhibition which was included in the scope of Achema VIII, a small book was published, the original intention of which was to act as a guide to visitors to this special exhibition. But, as a glance at the contents shows, this work has exceeded the bounds of an exhibition guide book.

It gives the expert, who has to deal both in the factory and in the laboratory with plastic materials, clear explanations of the kind of substances prepared from German raw materials, the intermediate stages through which they pass in manufacture, the plant and machinery necessary to their fabrication, their properties and methods of testing, and their applications.

Part A presents under the title "The Fundamentals of Plastics Chemistry" plastic raw materials in five comprehensive tables, and, in addition, the scheme covers the preparation of plastics starting from the raw materials through the intermediate products to the finished article. Part E deserves special mention as it gives the names, characteristics, and possible applications of the plastics which are used at the present time in Germany. The index offers to manufacturers and users a very valuable work of reference.

A TEXT-BOOK OF INORGANIC CHEMISTRY FOR UNIVERSITY STUDENTS. By J. R. Partington. Fifth Edition. pp. 1062. London: Macmillan and Co., Ltd. 15s.

The first edition of this book was published in 1921, and the fourth edition (1933) was revised in considerable detail to keep pace with modern advances in the subject of inorganic chemistry. In the present edition, numerous alterations have again become necessary. The heavier isotopes of hydrogen are dealt with more fully, the theory of indicators has been revised and extended, further details of technical processes for nitrogen fixation have been added, and a new section has been included on the structure of the silicates. The text is intended mainly for students who have completed an introductory course, and will be found especially suited to the needs of those preparing for the Intermediate and Final B.Sc. degree. Numerous illustrations are included, as well as the details for performing laboratory experiments. In addition, nearly fifty pages of questions appropriate to the text are provided as a separate section at the end of the book.

COLLOID SYSTEMS. By Dr. A. Von Buzagh. Translated by Otto B. Darbishire. Edited by William Clayton. pp. 311. London: The Technical Press, Ltd. 30s.

All are agreed that the science of colloids now constitutes a new branch not only of physical chemistry, but possibly even of chemistry and physics themselves, states Dr. Wolfgang Ostwald in his foreword to this book—which is a survey of the phenomena of modern colloid physics and chemistry. Moreover, it seems characteristic of certain modern scientific developments that they require a radical re-orientation of present ideas for their proper appreciation, the result being that it is possible to pick up a variety of detailed information about these branches of science, while the fundamental meaning remains obscure. Many chemists and physicists, for instance, have acquired quite a number of facts about colloids without being able to link them together and reconcile them with each other. It is possible for them to ask: What common properties have a gold sol, a gelatin gel, and a piece of silk fibre that they should be classed together as colloidal systems? And do colloidal systems and colloidal substances differ in nature or only in degree from other forms of matter? The present book, therefore, endeavours to produce in the scientific but "non-colloidal" reader the mental re-orientation necessary for a satisfactory comprehension of colloid science as a whole. The translation is practically literal, in the sense that every sentence present in the original is also present in some form in the translation. At the same time, care has been exercised to avoid any distortion of the sense of the original.

THE ELECTROCHEMISTRY OF SOLUTIONS. By S. Glasstone. Second Edition. pp. 551. London: Methuen and Co., Ltd. 25s.

The excellent reception accorded to the first issue of this book has encouraged the author to follow very much the same lines in the present edition, although the subject matter has been completely revised and brought up-to-date. The sections dealing with the theory of electrolytic dissociation and with over-voltage have been almost entirely re-written to conform with the latest developments in these subjects. Most of the material originally found in the chapter entitled "Acids and Bases," has been included in that on "Equilibria in Electrolytes," and the treatment of ionic product and hydrolysis, together with a general discussion of acid, base and solvent equilibria, has been incorporated in a new chapter. The author has found the modern viewpoint concerning acids and bases very illuminating, he states that its advantages should be more widely realised: it has, therefore, been employed in the consideration of solvent effects on acids and bases, of neutralisation and lyolysis (solvolysis), especially in non-aqueous media, and of certain aspects of amphoteric electrolytes. In order to keep the volume within reasonable proportions the treatment of electrolytic oxidation and reduction has been restricted to fundamental principles, another reason being that the author has recently published a comprehensive survey of the subject. As in the first edition, full references are given at every stage, but considerations of space have sometimes made it necessary to omit detailed mention of individual papers in favour of review articles.

THE ANALYTICAL CHEMISTRY OF TANTALUM AND NIOBIUM. By W. R. Schoeller. pp 198. London: Chapman and Hall, Ltd. 21s.

The text of this compact volume is based upon the researches of a team of workers which it was the author's privilege to captain. The results of their work—most of which was carried out at the Sir John Cass Technical Institute—are recorded in a series of papers published in *The Analyst* under the general title, "Investigations into the Analytical Chemistry of Tantalum, Niobium, and their Mineral Associates." In writing the present book, the author has carefully sifted the text of these investigations; but it should be emphasised that—with the exception of Chapter IV on Analytical Technique—the book is definitely a new production. It describes all the analytical methods given in the above-named papers, but these methods are welded into a comprehensive analytical scheme which is now published for the first time, with additional experimental work not previously recorded. Chapters V to XII treat of the fundamental propositions of analytical chemistry, viz., the quantitative separation and determination of a large number of rarer and other elements, and their scope is by no means confined to earth-acid analysis. The latter part of the book is really a small separate monograph on the recent analytical applications of tannin, in which the methods of the author and other workers are set out, with theoretical considerations on the action of the reagent. There is a foreword by Dr. G. Roche Lynch, president of the Society of Public Analysts.

"ANALAR" STANDARDS FOR LABORATORY CHEMICALS. Second Edition. pp. 296. London: British Drug Houses, Ltd., and Hopkins and Williams, Ltd.

The reception of the first edition of this book appears to have been extremely gratifying to the two chemical manufacturing concerns in whose laboratories it was formulated; the demand for the book, moreover, has been such as to render a second edition necessary in less than two and a half years from the original date of publication. The tests set out cover two hundred laboratory chemicals, and give extra support to the accuracy of the figures for maximum limits of impurities which appear on every bottle of the "Analar" brand of reagents; the actual specifications have additionally proved to be a convenient source of reference in general analytical practice. In a few instances continual experience in applying the tests has warranted modifications of technique, and these have been incorporated in the present edition. For example, it has been observed that the indophenine reaction for detecting thiopen in benzene cannot be combined with the test for organic impurities as described in the first edition, since it is essential for the isatin to be present before the benzene-acid is warmed. It has also been found necessary to modify the test for chloride in mercuric oxide by directing the preliminary removal of the mercury, as the silver test for chloride is insensitive in the presence of mercuric salts. Further, in order to avoid possible misinterpretation, some of the specifications have been more precisely defined. Professor Jocelyn F. Thorpe contributed a suitable foreword.

Petroleum Refining by Acids

Recovery of Hydrogen Sulphide

A METHOD of recovering hydrogen sulphide from the gases evolved during sulphuric acid refining of crude petroleum prior to cracking, which has been successfully employed on the large scale, is described by Craise and Brown (*Chem. Met. Eng.*, 1937, *44*, 7, 376-379). The recovered gas is burnt to sulphur dioxide from which sulphuric acid is made by the contact process, in practically sufficient quantity to balance the loss of this acid during refining.

Use of Sodium Phenolate

The gases, which contain 4 to 6 per cent. of H_2S, are passed up a scrubber at 150 lb. per sq in., in which a solution of sodium phenolate circulates, dissolving all the H_2S and some of the hydrocarbons in the incoming gas. The spent solution passes through a heat exchanger, where it is heated by hot solution from the final stage of the process, to a degasser, where the dissolved gases are evolved by reducing the pressure, and from whence they are passed into a second scrubber, also containing sodium phenolate solution, but operating at only 3 lb. per sq. in., and here only the H_2S is absorbed, the hydrocarbons escaping. The H_2S in solution is driven off by heating, the hot solution passing back to the first scrubber through the heat exchanger. The hydrogen sulphide is cooled to condense excess moisture and spray, and is then conducted to the sulphuric acid plant, where it is burnt, and the combustion gases, after drying, are led into the contact chamber. The efficiency of recovery of H_2S from the refinery gases is 93 to 97 per cent., higher recoveries not being economical.

The complete recovery plant, on account of the toxic nature of the gas dealt with, is housed in a completely gas-tight building, and all control is automatic. A jacketed pipe is used for conducting the gas from the recovery plant to the sulphuric acid factory, the jacket having welded joints and being connected to a furnace stack, so that any leak cannot cause the discharge of toxic fumes into the atmosphere.

Solid Carbon Dioxide

Food Preservation and Metal Shrinking

DEVELOPMENTS in the use of low temperature technique for the better maintenance in a fresh condition of perishable foods is referred to in *Deutsche Bergwerks Zeit.*, Scientific and Technical Section, July 22, 1937. One of the post-war developments in this sphere was the employment of solid carbon dioxide, or "dry ice," for food preservation and other purposes where low temperature is useful. Although it was known many years ago that carbon dioxide in solid form could be produced at a temperature of -79° C., only in the last 15 years has this knowledge been put to practical account in low temperature technique. The world sales of dry ice are now estimated to be about 100,000 tons yearly.

At a recent conference of "Kältetechniker," held in Bremen, Dr. Link gave interesting information regarding the use of dry ice. Of special importance was the information that popular judgment regarding the cost of employing dry ice was not right; experience in the cooling and keeping fresh of baked foods showed that the cost was about 50 per cent. lower than that expected from theoretical scientific calculations. It is also necessary in calculating the cost of employing dry ice to consider whether other means of cooling and preserving are insufficient or ineffective, as compared with dry ice; in the fish industry in particular, there are examples of this.

In the United States, about 90 per cent. of the yearly output of about 50,000 tons of dry ice is used in the ice-cream industry, but it is not generally known that dry ice is also becoming used in machine factories in cases where metal connections are made by the shrinkage method. The usually employed practice is to expand the metal parts by heat and to obtain the necessary shrinkage by the cooling of the metal; this involves the danger of a considerable change in the properties of the metal heated. Shrinkage of metal parts by means of the low temperature produced by dry ice, and its subsequent expansion when allowed to return to normal temperature, is an ideal method of connecting two metal parts very closely, as in tube connections. For the shrinking of 14 red-brass bearing boxes weighing 205 kg., 4.5 kg. of dry ice costing 1.20 marks is required.

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Personal Notes

MR. HUGH MCLEAN, of Monkland, Troon, Ayrshire, a director of Jamaica Sugar Estates, Ltd., has left personal estate in Great Britain valued at £136,547.

MR. G. E. PEARSON, governing director of the Welcome Foundation, Ltd., has received the Cross of Chevalier of the Legion of Honour from the President of the French Republic.

MR. JAMES MARSHALL, for the past 16 years manager of the Glenlossie Distillery, Lossiemouth, has been presented with a writing bureau by employees on leaving to become manager of the Convalmore Distillery, Dufftown.

MR. N. GASS AND MR. ROBERT PARKYN, both of the Anglo-Iranian Oil Co., have each received a legacy of £2,000 under the will of the Duchess of Bedford, for assistance rendered to the duchess when she made a forced landing in the desert in Persia nine years ago while flying to India.

MR. WALTER GEORGE IRELAND, of Southend-on-Sea, proprietor of W. V. Dowson and Co., High Holborn, London, W.C., druggists' sundriesmen, has left a legacy of £2,000 and his business to his secretary, Miss Ellen Edith Beveridge, of Highgate, London, N. Miss Beveridge had been employed by Mr. Ireland for 36 years, during eight of which she has managed his business of W. V. Dowson and Co.

MR. F. R. C. ROUSE, M.I.Mech.E., A.M.I.E.E., who has been technical manager of Venner Time Switches, Ltd., for a number of years, has recently been appointed to take over the duties of general manager. Mr. Rouse first joined Venners in 1910. For several years past he has been honorary secretary for the Finsbury Technical College Old Students' Association, and at the last (25th) annual dinner, a silver presentation was made to him as a recognition of his work. He is a member of the Chemical Club, the Clockmakers' Company, and a Fellow of the Physical Society.

MR. CHARLES THOMAS ROSS, managing director of Ross's (Leeds), Ltd., paint and varnish manufacturers, has left £37,869, with net personalty £37,412.

COLONEL H. C. B. HICKLING, who has been general manager in Trinidad of the Apex (Trinidad) Oilfields, Ltd., for eighteen years, has now been appointed a director of the company.

MR. R. C. DOCHERTY, of Perth, has retired from the service of Burt-Marshall, Ltd., bleachers, Luncarty, after 53 years' association with the firm. For a long period he has acted as secretary.

MR. THOMAS RICHARD GRIMWOOD, of Tippendell Lodge, Tippendell Lane, St. Albans, a director of the Enamelled Metal Products Corporation (1935), has left £28,332, with net personalty £25,659.

DR. C. D. LAWRENCE, chemist in the Department of the Admiralty Chemist, Portsmouth, has been elected a Fellow of the Institute of Chemistry. Dr. Lawrence is an active member of the Portsmouth Chemical Society. Before coming to Portsmouth he was a chemist on the inspection staff of the R.N. Cordite Factories.

OBITUARY

MISS MURIEL BOLTON, of Hull, who was president of the Hull Chemists' Association in 1933, and for some time the only woman member of the Pharmaceutical Society in Hull, has died at the age of 49.

MR. A. U. BRUNER, of the Sandoz Chemical Works, of Basle, has been killed during a bombardment at Shanghai.

MR. FREDERICK WILLIAM COOKE, a director of Associated British Maltsters, Newark-on-Trent, and of Edme, Ltd., malt extract manufacturers, died on August 20.

Chemical Notes from Foreign Sources

Sweden

ACETIC ACID IS NOW BEING MANUFACTURED from waste sulphite liquors by the Stora Kopparbergs Bergslags A.B.

Holland

PRODUCTION HAS BEEN RESUMED at the Leerdam glass bottle factory of the N.V. Vereenigde Glasfabrieken zu Schiedam, which has lain idle for the past 6 years.

France

THE MANUFACTURE OF SULPHUR AND PRUSSIAN BLUE from used gas-purifying masses is to be embarked upon by the Marseilles Gas and Electric Co., in collaboration with a chemical concern.

NEW CHEMICAL CONCERNS include :—Les produits vétérinaires Sado, 182 boulevard Saint-Germain, Paris, capital 60,000 francs (manufacture of chemical and veterinary products); Société technique et industrielle du caoutchouc, 40 rue Brunel, Paris, capital 25,000 francs (trade in rubber and its by-products and derivatives); Société Renovatex, 20 rue Richer, Paris, capital 100,000 francs (cosmetic products).

Japan

ETHYLENE GLYCOL MANUFACTURE by a newly-developed Japanese process is to be commenced by the Nippon Gosei Kagaku Kogyo K.K.

NEW SULPHURIC ACID WORKS are under construction by the Nippon Kogyo K.K. at Hidachi and Saganoseki. The former will utilise pyrites; the latter, waste gases.

ACTIVE CARBON IS NOW BEING MADE by the Nippon Carbon K.K., at the annual rates of 200 tons powder and 80 tons granules. Extensions to the plant will eventually result in outputs of 1,000 tons and 300 tons respectively.

Italy

A NEW PROCESS FOR THE MANUFACTURE OF CALCIUM CITRATE from lemons has been developed and is believed to give better yields and a high degree of purity.

Switzerland

CERTAIN ESTERS OF THE FOLLICULAR HORMONES have been found by Milscher and Schotz to be more powerful in physiological action than the hormones themselves. Among the derivatives conspicuous in this respect are oestrone propionate, oestradiol dibutyrate and oestradiol mon-opalmitate.

Germany

A NEW METHOD FOR THE PERMANENT BLACKENING of galvanised sheet metal (*Chemiker-Zeitung*, No. 50, p. 519) makes use of a solution of 138 parts manganese sulphate and 130.5 parts barium nitrate (sp.gr. 1,125) in which the metal is dipped several times. The resulting coatings are said to be weather- and acid-resistant and do not peel off when hammered.

Roumania

ARSENIC ACID IS NOW IN PRODUCTION at the Valea Calugareasea works of the Marasesti Co.

SODIUM THIOSULPHATE MANUFACTURE has been started by the "Phœnix Works" at Baia-Mare, in Northern Roumania.

GAS MASK PRODUCTION ON AN EXTENSIVE SCALE is now carried on by the "Antigas" Chemical Works, at Lupeni, in the Schyl Valley.

NEW CHEMICAL CONCERNS include :—The Romochim S.A., capital 8 million lei (manufacture of textile chemicals); The Mineroin Co., Cernauti, capital 3 million lei (manufacture of dyeing assistants).

From Week to Week

A FIRE AT THE SUGAR REFINERY belonging to Leach's Argentine Estates, Ltd., Jujuy, Argentina, has destroyed about 15,000 bags of sugar. The damage is estimated at from £6,000 to £10,000.

SCOTTISH OILS AND SHELL MEX, LTD., have been refused application for a site at North Ness, Lerwick, for a petroleum oil depot to hold 84,000 gallons of petroleum and 120,000 gallons of kerosene.

THE FOREIGN TRADE OF SWEDEN in July shows a positive balance for the first time since August last year. Imports amounted to £9,536,000 and exports to £9,758,000, leaving an export surplus of £222,000.

THE WAR OFFICE HAS DECIDED to relax its original regulation as to the employment of men over 45 years of age at the new ordnance factory at Nottingham. The subject was raised by the local engineers' union.

THE TREATMENT OF BOILER FEED WATER with trisodium phosphate according to the Budenheim Process is described in a booklet (No. 14) which has been issued by Phosphates, Ltd. The Budenheim Process can be adapted to all conditions of a boiler plant.

THE D'ARCY EXPLORATION CO. has abandoned its search for oil at Poxwell, near Weymouth, Dorset. Drilling was started in May with the object of testing the corallian formation. The well was carried to a depth of 1,666 ft., but oil was not found in commercial quantities.

NEGOTIATIONS ARE UNDERSTOOD TO BE IN PROGRESS for the acquisition of Smedley Dyers of Manchester by the Bradford Dyers' Association. Smedley Dyers is a private company, with an authorised capital of £20,000, of which £19,000 is paid up. The company employs about 120 workers.

GERMAN COKE PRODUCTION at pits and iron foundries during the first seven months of the current year totalled 23,750,000 tons, an increase of 3,600,000 tons compared with the corresponding period of last year. Coke production during the past four years has been more than doubled.

AN ACETYLENE GENERATOR EXPLODED in the Great Western Railway carriage and wagon works at Swindon on August 24, and caused injury to four workmen. The generator caught fire, but the flames were soon extinguished. One of those injured, Leonard Sainsbury (25), was severely burnt on the arms and face and detained in hospital.

AT SEVERAL OF THE COUNTRY FETES this summer, china clay workers have displayed their muscular prowess by competing in several tug-o'-war events. Through the efforts of Mr. A. Davies, one of the joint managing directors of English Clays, Lovering, Pochin and Co., Ltd., there was a mass tournament staged at the Trevhosa Park, St. Austell, on August 19, the Society of which Mr. Davis is its esteemed leader. Twenty-six teams entered for the contest.

FOREIGN CONSUMPTION OF LEADED MOTOR FUEL is rising according to a report made public by the Ethyl Gasoline Corporation. In Great Britain and Ireland the Ethyl distribution during the first four months of 1937 increased 31.8 per cent., while the total increase of all gasolines distributed by the Ethyl licensees in this area was 19.3 per cent. Great Britain licensees of the Ethyl Gasoline Corporation include the Anglo-American Oil Co., the Irish-American Oil Co., Redline Glico, Ltd., Shell-Mex and B.P., Ltd., and Texas Co., of Ireland.

UNEMPLOYMENT STATISTICS FOR JULY, as published in the August issue of *The Ministry of Labour Gazette*, show that a total of 11,384 males and 2,117 females were registered as being unemployed in the chemical, etc., industries in Great Britain. These statistics relate exclusively to persons aged 16 to 64, who are under the general unemployment insurance scheme. Statistics classified separately for sub-divisions of the chemical industries are as follows:—Chemicals, 5,524 males, 874 females; explosives, 472 males, 161 females; paint, varnish, red lead, etc., 810 males, 168 females; oil, glue, soap, ink, matches, etc., 4,578 males, 914 females. Additional to these totals there were 51 boys and 147 girls under 16 years of age for the complete group of industries.

FORTY PER CENT OF THE WORLD'S PUBLICATIONS carrying reports of chemical research appear in English-speaking countries, with the United States leading, states Professor E. J. Crane, of Ohio State University, editor of *Chemical Abstracts*, in which the findings of the international science reporting system of the American Chemical Society are recorded. The periodicals published in English are a little more productive than the average. Of the 494 journals of chemical interest issued in the British Empire, 40 appear in Australia, 58 in Canada, 277 in England, 48 in India, 6 in Ireland, 11 in New South Wales, 7 in New Zealand, and 13 in Scotland. The United States publishes 607, or 22.2 per cent. of the world total of 2,726 periodicals in which new chemical research is recorded. British Empire contributions are 18.1 per cent. of the total.

A DECREE ISSUED BY THE PERUVIAN GOVERNMENT declares all helium underground in the country to be the property of the State.

THE AUSTRALIAN GOVERNMENT propose to establish munitions factories and foster industries which would increase the country's self-sufficiency.

POLLOPAS PATENTS, LTD., J. C. Vredenburg-Inglesby, have changed their address to 3 Vere Street, Oxford Street, London, W.1. Telephone: Mayfair 6334.

THE BRITISH INDESTRUCTO GLASS CO. has now completed its building programme. Duplicate new automatic cutting and grinding machinery has been installed, thus further increasing throughput of factory.

A RELEASE OF LIQUIDATOR (J. E. Williams, 35 Westgate, Huddersfield) in the matter of British Coal Refining Processes, Ltd., of 3 Central Buildings, Westminster, S.W.1, is announced in *The London Gazette*, as from July 20, 1937.

THE MEXICAN GOVERNMENT has granted to the Mexican Eagle Oil Co., and its two sister companies, the Mexican Petroleum Corporation and the Jonker Co., permits to drill fifteen wells in the Central and Southern Vera Cruz State fields.

THE BRITISH PLASTICS FEDERATION is now putting into being a comprehensive and effective Inquiry Department, and all inquiries connected with the plastics industry will be welcomed from members and non-members of the organisation.

MANESTY MACHINES, LTD., manufacturers of automatic water stills and tablet compressing machines, have decided to work a five-day week for a trial period at their new works at Speke Hall Road, Liverpool, 19. From the results of this trial the future policy of the firm will be determined.

DIATOMACEOUS EARTH, "not bagged or otherwise packed, containing not less than 35 per cet. of moisture," is to be exempt from Import Duty as from August 20; and diatomaceous earth "raw, as quarried," is to be removed from the Free List, in accordance with recommendations submitted by the Import Duties Advisory Committee.

A FURTHER INCREASE IN THE ADVERSE BALANCE OF TRADE in France, took place in July. Imports totalled 3,199,715,000f., against 1,859,710,000f. in July, 1936, and exports were 1,872,121,000f., against 1,103,523,000f. For the first seven months of the year imports were 23,482,204,000f., against 13,808,847,000f. in the corresponding period last year, and exports were 12,907,344,000f., against 8,308,090,000f.

THE BRITISH COMMERCIAL GAS ASSOCIATION has published a booklet which shows how the introduction of gas for water heating, as well as for laboratory and technical work, in modern colleges has simplified running and given more hygienic conditions. Published under the title of "The Equipment of Schools and Colleges" it is obtainable post free on application to the Association, 1 Grosvenor Place, London, S.W.1.

THE INDIAN SCIENCE CONGRESS ASSOCIATION will hold their 25th annual meeting in Calcutta on January 3-9, 1938, under the presidency of Lord Rutherford. To mark the silver jubilee of the Association, the meeting is to be a joint session with the British Association. About 100 scientists have been invited from Great Britain. The chemistry section will be under the presidency of Professor S. S. Bhatnager, director of the University Chemical Laboratories, Lahore. The address of the General Secretary of the Indian Science Congress Association is c/o The Geological Survey of India, 27 Chowringhee, Calcutta.

AS A RESULT OF AN ESCAPE OF FUMIGATION GAS, eight persons, including three policemen, were affected by fumes in a house at Prideaux Place, Percy Circus, King's Cross, London, on August 23. One of the victims, Mrs. A. Jenkinson, has since died in the Royal Free Hospital to which all the victims were removed. The discovery was made when a police officer was called by neighbours who observed a curious odour in the street outside the house. Cyanide gas is suspected as being the cause of the tragedy, and is believed to have come from premises at the rear of the house, which were being fumigated. Mr. E. G. Barrett, one of the persons detained in hospital, is an employee of the Gaslight and Coke Co.

SAFEGUARDING OF INDUSTRIES (EXEMPTION) NO. 5 ORDER, 1937, relates to acetamidosalol (acetylamido phenol salicylate), amidopyrine-barbitone, calcium monoiodobehenate, p. diethoxy ethenyl diphenyl amidine and its hydrochloride, menthyl ethyl glycollate, methyl amidoxy benzoate, phenetidyl-phenacetin and its hydrochloride, phenyl guanidine, decamethylene diguanidine dihydrochloride, dodeca methyl diguanidine hydrochloride, sodium phenyl dimethyl pyrazolone amino methane sulphonate, and valeryl diethylamide. If these products are not entered under the Customs Acts before August 19, 1937, or have not been removed from a bonded warehouse before that date, they shall be exempt from the duty imposed by Section 1 of the Safeguarding of Industries Act as amended by the Finance Act, 1926, for a period ending December 31, 1937.

Weekly Prices of British Chemical Products

THE only change to report in the London market prices this week is for pyridine. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

MANCHESTER.—Only moderate buying interest has been displayed on the Manchester chemical market during the past week, new orders being mostly confined to prompt or near deliveries. The majority of users, however, are well covered for supplies against contracts extending up to the end of the year and allowing for holiday influences, which are still in evidence in Lancashire industrial areas, the flow of specifications is on a steady scale and in the aggregate fairly good quantities of materials are involved. Inquiry on export account on this market has been rather quiet. Fresh business in the by-products has also been on a relatively limited scale, although here again good contract deliveries are reported in most sections. A moderate export demand for pitch has again been experienced and prices are maintained.

GLASGOW.—Business in chemicals has been rather quiet during the week, both for home trade and export. Prices, however, continue very firm at about previous figures, with no important changes to report. There has been a steadier flow of business in coal tar products during the week and, apart from certain grades of cresylic acid, the tone of the market continues very firm. Carbolic acid has again been active with the demand in excess of available supplies. Creosote and washed oils are moving regularly against contract and there have been several interesting inquiries for high tar acid oils. Pyridines showed a further appreciation in value, with actual fresh business done at 9s. 6d. per gallon for the 90%160 quality, and quotations for the lighter 90%140 fraction going as high as 11s. 6d.

General Chemicals

ACETONE.—£45 to £47 per ton.

ACID, ACETIC.—Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £30 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ACID, BORIC.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

ACID, CHROMIC.—9¼d. per lb., less 2½%; d/d U.K.

ACID, CITRIC.—1s. per lb. MANCHESTER: 1s. SCOTLAND: B.P. crystals, 1s. per lb., less 5%, ex store.

ACID, FORMIC.—85%, in carboys, ton lots, £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 5s. to 7s. 6d. carboy d/d according to purity, strength and locality.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50: pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works.

ACID, OXALIC.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £54 per ton ex store.

ACID, SULPHURIC.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

ACID, TARTARIC.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb. GLASGOW: 1s. 1d. per lb.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 per ton d/d Lancs.; GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10½d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £16 10s. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—£55 10s. per ton.

ARSENIC.—LONDON: £13 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £17 ex store. MANCHESTER: White powdered Cornish £17 10s., ex store.

BARIUM CHLORIDE.—£10 per ton. GLASGOW: £11 5s. per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%. £8 15s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d

COPPER SULPHATE.—GLASGOW: £24 per ton.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£22 10s. per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £5 7s. 6d. to £6 7s. 6d. per cwt. according to quantity; in drums, £5 to £5 13s. 6d.

IODINE.—Resublimed B.P., 6s. 4d. per lb. in 7 lb. lots.

LEAD ACETATE.—LONDON: White, £35 10s. per ton; brown, £35. GLASGOW: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £36; brown, £35 10s.

LEAD NITRATE.—£39 per ton.

LEAD, RED.—SCOTLAND: £37 per ton, less 2½%, carriage paid for 2-ton lots.

LEAD (WHITE SUGAR OF).—GLASGOW: £36 10s. per ton net, ex store.

LITHARGE.—SCOTLAND: Ground, £37 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store

MAGNESIUM CHLORIDE.—SCOTLAND: £7 10s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d. per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.) 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip.), 7s.; levig. 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum sulph. 50%), 6s. For quantities under 112 lb., 1d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

PHENOL.—7¾d. to 8¼d. per lb.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £39.

POTASSIUM BICHROMATE.—SCOTLAND: 5d. per lb., net, carriage paid.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £38 per ton.

POTASSIUM IODIDE.—B.P. 5s. 6d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—£27 per ton. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. Crystals, 9¾d. MANCHESTER: B.P. 11d. to 1s.

POTASSIUM PRUSSATE.—6½d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6½d.

SALAMMONIAC.—Firsts lump spot, £41 17s. 6d. per ton d/d in barrels. GLASGOW: Large crystals, in casks, £37.

SALT CAKE.—Unground, spot, £3 16s. 6d. per ton.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £12 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77°, £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£18 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. MANCHESTER: 4d. per lb. GLASGOW: 4d., net, carriage paid.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 5s. per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£26 10s. to £30 per ton. GLASGOW: £1 10s. per cwt., minimum 3 cwt. lots.

SODIUM CHROMATE.—4d. per lb. d/d U K

SODIUM HYPOSULPHATE.—Commercial, 2 ton lots d/d, £10 5s. per ton; photographic, £15. MANCHESTER: Commercial, £10; photographic, £14 10s.

SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £7 15s. per ton for 6-ton lots d/d.

Sodium Nitrite.—£18 5s. per ton for ton lots.
Sodium Perborate.—10%, 9½d. per lb. d/d in 1-cwt. drums.
Sodium Phosphate.—£13 per ton.
Sodium Prussiate.—4d. per lb. for ton lots. Glasgow: 5d. to 5¾d. ex store. Manchester: 4d. to 4¾d.
Sodium Silicate.—£9 10s. per ton.
Sodium Sulphate (Glauber Salts).—£3 per ton d/d.
Sodium Sulphate (Salt Cake).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. Scotland: Ground quality, £3 5s. per ton d/d. Manchester: £3 12s. 6d.
Sodium Sulphide.—Solid 60/62%, Spot, £11 5s. per ton d/d in drums; crystals 30/32%, £8 15s. per ton d/d in casks. Manchester: Concentrated solid, 60/62%, £11; commercial, £8 10s.
Sodium Sulphite.—Pea crystals, spot, £13 5s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
Sulphate of Copper.—£20 per ton, less 2%, in casks. Manchester: £22 5s. per ton f.o.b. Scotland: £24 per ton less 5%, Liverpool, in casks.
Sulphur Precip.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
Zinc Sulphate.—Crystals, £9 per ton, f.o.r., in bags.

Rubber Chemicals

Antimony Sulphide.—Golden, 6½d. to 1s. 1d. per lb., according to quality. Crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.
Arsenic Sulphide.—Yellow, 1s. 5d. to 1s. 7d. per lb.
Barytes.—£6 to £7 10s. per ton, according to quality
Cadmium Sulphide.—7s. 8d. to 7s. 11d. per lb.
Carbon Bisulphide.—£31 to £33 per ton, according to quantity, drums extra.
Carbon Black.—3 11/16d. to 4 13/16d. per lb., ex wharf.
Carbon Tetrachloride.—£41 to £46 per ton, according to quantity, drums extra.
Chromium Oxide.—Green, 1s. 2d. per lb.
Diphenylguanidine.—2s. 2d. per lb.
India-rubber Substitutes.—White, 4¾d. to 5¼d. per lb.; dark, 4d. to 4½d. per lb.
Lamp Black.—£22 to £23 per ton d/d London; vegetable black, £28 to £48.
Lead Hyposulphite.—9d. per lb.
Lithopone.—30%, £16 10s. to £17 5s. per ton.
Sulphur.—£9 to £9 5s. per ton. Sulphur precip. B.P., £55 to £60 per ton. Sulphur precip. comm., £50 to £55 per ton.
Sulphur Chloride.—5d. to 7d. per lb., according to quantity.
Vermilion.—Pale, or deep, 5s. 3d. per lb., 1-cwt. lots.
Zinc Sulphide.—10d. to 11d. per lb., according to quality.

Nitrogen Fertilisers

Sulphate of Ammonia.—The following prices have been announced for neutral quality basis 20.6= nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1938: August, 1937, £7 3s. 6d. per ton; September, £7 5s.; October, £7 6s. 6d.; November, £7 8s.; December, £7 9s. 6d.; January, 1938, £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.
Calcium Cyanamide.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: August, 1937, £7 6s 3d. per ton; September, £7 7s. 6d.; October, £7 8s. 9d.; November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.
Nitro-Chalk.—£7 10s. 6d. per ton for delivery up to June 30, 1938.
Nitrate of Soda.—£8 per ton for delivery up to June 30, 1938.
Concentrated Complete Fertilisers.—£10 12s. to £11 1s. per ton for delivery up to August 31, in 6-ton lots to farmer's nearest station.
Ammonium Phosphate Fertilisers.—£10 5s. to £13 5s. per ton for delivery up to August 31, in 6-ton lots to farmer's nearest station.

Coal Tar Products

Acid, Cresylic.—97/99%, 5s. 3d. to 5s. 5d. per gal.; 99/100%, 5s. to 6s., according to specification; pale 99%, 5s. 6d. to 5s. 8d.; dark, 4s. 8d. to 4s. 10d. Glasgow: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 4s. 3d. to 4s. 6d. Manchester: Pale, 99/100%, 5s.
Acid, Carbolic.—Crystals, 7¾d. to 8¼d. per lb.; crude, 60's, 4s. 3d. to 4s. 6d. per gal. Manchester: Crystals, 9d. per lb. f.o.b. in drums; crude, 4s. per gal. Glasgow: Crude, 60's, 4s. 3d. to 4s. 6d. per gal.; distilled, 60's, 4s. 4d. to 4s. 8d.
Benzol.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 8d. to 1s. 8½d. Glasgow: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d.
Creosote.—B.S.I. Specification standard, 6d. per gal. f.o.r. Home, 3¾d. d/d. London: 4½d. f.o.r. North: 5d. London. Manchester: 5½d. to 6½d. Glasgow: B.S.I. Specification, 6d. to 6¼d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5½d. to 5¾d.
Naphtha.—Solvent, 90/160%, 1s. 6½d. to 1s. 7½d. per gal.; 95/160%, 1s. 8d. to 1s. 9d.; 90/190%, 1s. 1½d. to 1s. 3d. London: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. Glasgow: Crude, 6½d. to 7½d. per gal.; 90% 160, 1s. 5d. to 1s. 6d., 90% 190, 1s. 1d. to 1s. 2d.
Naphthalene.—Crude, whizzed or hot pressed, £10 to £11 per ton; purified crystals, £18 to £20 per ton in 2-cwt. bags. London: Fire lighter quality, £5 to £5 10s. per ton; crystals, £27 to £27 10s. Glasgow: Fire lighter, crude, £6 to £7 per ton (bags free). Manchester: Refined, £21 per ton f.o.b.
Pitch.—Medium, soft, 38s. per ton, in bulk at makers' works. Manchester: 36s. to 37s. f.o.b., East Coast. Glasgow: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.
Pyridine.—90/140%, 10s. to 11s. 6d. per gal.; 90/180, 2s. 9d. to 3s. 6d. Glasgow: 90% 140, 9s. to 10s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. Manchester: 9s. 6d. to 11s. at works
Toluole.—90%, 2s. per gal.; pure, 2s. 6d. Glasgow: 90%, 120, 1s. 11d. to 2s. per gal.
Xylol.—Commercial, 2s. 3d. per gal.; pure, 2s. 5d. Glasgow: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

Acetate of Lime.—Brown, £8 5s. to £8 15s. per ton; grey, £10 10s. to £11 10s. Liquor, brown, 30° Tw., 6d. to 8d. per gal. Manchester: Brown, £9 10s.; grey, £11 10s.
Charcoal.—£6 5s. to £12 per ton, according to grade and locality.
Methyl Acetone.—40-50%, £42 to £45 per ton.
Wood Creosote.—Unrefined 6d. to 1s. per gal., according to boiling range.
Wood, Naphtha, Miscible.—2s. 9d. to 3s. 3d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.
Wood Tar.—£3 to £4 per ton.

Intermediates and Dyes

Acid, Benzoic, 1914 B.P. (ex toluol).—1s. 9½d. per lb. d/d buyer's works.
Acid, Gamma.—Spot, 4s. per lb. 100% d/d buyer's works.
Acid, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
Acid Naphthionic.—1s. 8d. per lb.
Acid, Neville and Winther.—Spot, 3s. per lb. 100%.
Acid, Sulphanilic.—Spot, 8d. per lb. 100%, d/d buyer's works.
Aniline Oil.—Spot, 8d. per lb., drums extra, d/d buyer's works.
Aniline Salts.—Spot, 8d. per lb. d/d buyer's works, casks free.
Benzidine, HCl.—2s. 5d. per lb., 100% as base, in casks.
***m*-Cresol 98/100%.**—1s. 8d. to 1s. 9d. per lb. in ton lots.
***o*-Cresol 30/31° C.**—6½d. to 7½d. per lb. in 1-ton lots.
***p*-Cresol 34-5° C.**—1s. 7d. to 1s. 8d. per lb. in ton lots.
Dichloraniline.—1s. 11½d. to 2s. 3d. per lb.
Dimethylaniline.—Spot, 1s. 6d. per lb., package extra.
Dinitrobenzene.—7½d. per lb.
Dinitrochlorbenzene, Solid.—£72 per ton.
Dinitrotoluene.—48/50° C., 8½d. per lb.; 66/68° C., 10d.
Diphenylamine.—Spot, 2s. per lb., d/d buyer's works.
α-Naphthol.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-Naphthol.—9½d. to 9⅝d. per lb.; flake, 9½d. to 9⅝d.
***a*-Naphthylamine.**—Lumps, 1s. per lb.; ground, 1s. 0½d. in casks.
β-Naphthylamine.—Spot, 2s. 9d. per lb., d/d buyer's works in casks.
***o*-Nitraniline.**—3s. 11d. per lb.
***m*-Nitraniline.**—Spot, 2s. 7d. per lb., d/d buyer's works.
***p*-Nitraniline.**—Spot, 1s. 8d. to 2s. 1d. per lb. d/d buyer's works.
Nitrobenzene.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.
Nitronaphthalene.—9d. per lb.; P.G., 1s. 0½d. per lb.
Sodium Naphthionate.—Spot, 1s. 9d. per lb., 100% d/d buyer's works.
***o*-Toluidine.**—10½d. per lb., in 8/10-cwt. drums, drums extra.
***p*-Toluidine.**—1s. 10½d. per lb., in casks.
***m*-Xylidine Acetate.**—4s. 3d. per lb., 100%.

Latest Oil Prices

London, Aug. 25.—Linseed Oil was steady. Spot, £31 15s. (small quantities); Sept., £29 2s. 6d.; Sept.-Dec., £29 5s.; Jan.-April and May-Aug., £29, naked. Soya Bean Oil was slow. Oriental (bulk), afloat, Rotterdam, £23 10s., sellers. Rape Oil was quiet. Crude extracted, £37; technical refined, £38, naked, ex wharf. Cotton Oil was steady. Egyptian crude, £26; refined common edible, £29 10s.; deodorised, £31 10s., naked, ex mill (small lots, £1 10s. extra). Turpentine was quiet. American, spot, 35s. 9d. per cwt.

Hull.—Linseed Oil, spot, quoted £30 5s. per ton; Aug., £29 15s.; Sept.-Dec., £29 10s.; Jan.-April, £29 5s. Cotton Oil, Egyptian, crude, spot, £25 10s.; edible, refined, spot, £28 10s.; technical, spot, £28 10s.; deodorised, £30 10s., naked. Palm Kernel Oil, crude, f.m.q., spot, £24, naked. Groundnut Oil, extracted, spot, £30 10s.; deodorised, £33 10s. Rape Oil, extracted, spot, £36; refined, £37. Soya Oil, extracted, spot, £30 10s.; deodorised, £33 10s. per ton. Cod Oil, f.o.r. or f.a.s., 27s. 6d. per cwt., in barrels. Castor Oil, pharmaceutical, 44s. 6d.; first, 39s. 6d.; second, 37s. 6d. Turpentine, American, spot, 37s. 9d. per cwt.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

CELLULOSE DERIVATIVES.—J. Altwegg. 21742.

LUBRICATION OF LEATHER.—American Cyanamid and Chemical Corporation. (United States, Aug. 8, '36.) 21785.

PRODUCTION OF RESINOUS COMPOSITIONS.—Bakelite, Ltd. (United States, Aug. 18, '36.) 21792.

BLEACHING PROCESSES.—T. E. Bell. 22044.

MAGNESIUM ALLOYS.—G. von Giesche's Erben Bergwerksges. (Germany, April 15.) 2167, 21646.

MANUFACTURE OF CYCLIC SULPHONIC ACID-AMIDE COMPOUNDS.—A. Carpmael (I. G. Farbenindustrie.) 22014.

MANUFACTURE OF METAL HYDROXIDES, ETC.—A. Carpmael (I. G. Farbenindustrie.) 22115.

PAINTS, ETC.—A. Carpmael (I. G. Farbenindustrie.) 22116.

MANUFACTURE OF DISPERSIONS, ETC.—A. Carpmael (I. G. Farbenindustrie.) 22117.

MANUFACTURE OF ARYL-SUBSTITUTED MONO-OLEFINES, ETC.—Distillers Co., Ltd., H. M. Stanley, and J. B. Dymock. 21893.

TREATMENT OF FIBRES.—Distillers Co., Ltd. 22109.

MANUFACTURE OF ORGANIC SUBSTANCES.—H. Dreyfus. 21623.

MANUFACTURE OF LUBRICATING MATERIALS.—E. I. du Pont de Nemours and Co., and J. H. Werntz. 21659.

IMPREGNATION OF POROUS MATERIALS.—E. I. du Pont de Nemours and Co. 21660.

BLEACHING PROCESSES.—E. I. du Pont de Nemours and Co. 22044.

CLEANSING COMPOSITIONS.—E. I. du Pont de Nemours and Co., and G. R. Ensminger. 22045.

MANUFACTURE OF SYNTHETIC RESINS.—G. D. Graves, and E. I. du Pont de Nemours and Co. 21658.

MANUFACTURE OF N-AMINOALKYL-AROYLAMIDES.—W. W. Groves (I. G. Farbenindustrie.) 21611.

LUMINOUS PAINTS.—W. W. Groves (I. G. Farbenindustrie.) 21612.

MANUFACTURE OF N-METHYLSULPHITES and N-methane-sulphinic acid salts.—W. W. Groves (I. G. Farbenindustrie.) 21709, 21711.

MANUFACTURE OF CONDENSATION PRODUCTS.—W. W. Groves (I. G. Farbenindustrie.) 21710.

MANUFACTURE OF PANCREAS HORMONE PREPARATIONS.—W. W. Groves (I. G. Farbenindustrie.) 21875.

WATERPROOFING OF TEXTILE MATERIALS.—W. W. Groves (I. G. Farbenindustrie.) 21987.

MANUFACTURE OF AMIDES.—W. W. Groves (I. G. Farbenindustrie.) 21988.

MANUFACTURE OF HYPOSULPHITE.—I. G. Farbenindustrie. (Germany, August 7, '36.) 21905.

DEACIDIFICATION OF CHROME LEATHER.—I. G. Farbenindustrie. (Germany, Oct. 31, '36.) 22013.

XANTHATION OF CELLULOSE.—L. Mellersh-Jackson (Brown Co.). 21998.

MANUFACTURE OF WATER-SOLUBLE POLYMERISATION PRODUCTS.—G. W. Johnson (I. G. Farbenindustrie.) 21607.

MANUFACTURE OF HALOGENATED PHTHALOCYANINES.—G. W. Johnson (I. G. Farbenindustrie.) 21698.

MANUFACTURE OF SURFACE-ACTIVE SUBSTANCES.—G. W. Johnson (I. G. Farbenindustrie.) 21877.

LUBRICANTS.—Imperial Chemical Industries, Ltd. 22122.

MANUFACTURE OF PLASTIC MASSES.—G. W. Johnson (I. G. Farberindustrie.) 21878, 21879.

APPARATUS FOR CARRYING OUT CATALYTIC REACTIONS IN THE GAS PHASE.—G. W. Johnson (I. G. Farbenindustrie.) 22010.

MANUFACTURE OF POLYMERISATION PRODUCTS.—G. W. Johnson (I. G. Farbenindustrie.) 22011.

APPARATUS FOR MIXING, ETC., VISCOUS LIQUIDS.—G. W. Johnson (I. G. Farbenindustrie.) 22012.

MANUFACTURE OF UNSATURATED ALIPHATIC OR CYCLOALIPHATIC COMPOUNDS containing a halogen.—G. W. Johnson (I. G. Farbenindustrie.) 22098.

CARRYING OUT CATALYTIC REACTIONS.—G. W. Johnson (I. G. Farbenindustrie.) 22099.

ADHESIVE COMPOSITIONS containing rubber.—F. A. Jones, Dunlop Rubber Co., Ltd., and D. F. Twiss. 21687.

MANUFACTURE OF CONCENTRATED GAS LIQUOR.—W. T. Kitching, P. Parrish, and W. L. Burns. 21614.

REFINING OF LIGHT OIL.—Kohle und Eisenforschung Ges. (Germany, Feb. 24.) 21604.

REFINING OF LIGHT OIL.—Kohle und Eisenforschung Ges. (Germany, March 25.) 21605.

AUTOMATIC CONTROL OF CHEMICAL, ETC. CONDITIONS.—Lindberg Engineering Co., Inc. (United States, Aug. 22, '36.) 22025.

PURIFICATION OF WASTE LIQUORS.—E. Maier. (Switzerland, Aug. 18, '36.) 21926.

POLYMERISATION OF ORGANIC SUBSTANCES.—G. Minkoff and Distillers Co., Ltd., H. M. Stanley and J. E. Youell. 21892.

MANUFACTURE OF HYDROGEN PEROXIDE.—Naamlooze Vennootschap Industrieele Maatschappij voorheen Noury and Van Der Lande. (Holland, Aug. 14, '36.) 21915.

HYDROLISATION OF CELLULOSIC BODIES with hydrogen halides. E. Neu. (Germany, Aug. 8, '36.) 21872.

HYDROLISATION OF CELLULOSIC BODIES with hydrogen halides. E. Nei. (Germany, Feb. 1.) 21873, 21874.

EXTRACTION OF LIQUID from cashew-nut shells.—Peirce, Leslie and Co., Ltd. (Jefferies). 22089.

PROCESS OF MAKING ALKALI SUB-SILICATES.—Pennsylvania Salt Manufacturing Co. (United States, Sept. 3, '36.) 21880.

PREPARATION OF ALKYLIDENE-DIVINYL ETHERS and their polymers. H. E. Potts (Carbide and Carbon Chemicals Corporation.) 22065.

PRODUCTION OF ARTIFICIAL MASSES.—E. Rheinberger. (Germany, Aug. 7, '36.) 21794.

COMPOSITIONS OF LEAD.—Richardson Co. (United States, May 15.) 21747.

CONCRETE-MIXTURES containing magnesia.—R. Scheibe. (Germany, Aug. 10, '36.) 21946.

CONTAINERS FOR LIQUIDS, ETC.—Schering, A.-G., formerly Schering-Kahlbaum, A.-G. (Germany, Aug. 10, '36.) 22016.

ELECTRIC FURNACES for melting glass.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauny, and Cirey. (Germany, Aug. 14, '36.) 22090.

CELLULOSE DERIVATIVES.—Soc. des Usines Chimiques Rhone-Poulenc, and J. Altwegg. 21742.

PROCESS OF DEWAXING OILS.—W. W. Triggs (Mid-Continental Petroleum Corporation). 22035.

PAINT-REMOVING LIQUIDS.—F. G. Yearsley. 21868.

METHOD OF PREPARING A CATALYST from copper and aluminium. Association of American Soap and Glycerine Producers, Inc. (United States, Aug. 17, '36.) 22576.

INCORPORATION OF CELLULOSE ETHERS IN ESSENTIAL OILS, ETC.—M. Bandli. (March 20, '36.) 22342.

INCORPORATION OF CELLULOSE ETHERS IN RUBBER, ETC.—M. Bandli. (March 20, '36.) 22343.

TREATMENT OF LEATHER, ETC.—M. Bandli. 22518.

COATING-COMPOSITIONS.—Carbide and Carbon Chemicals Corporation. (United States, Sept. 10, '36.) 22254.

DRY COSMETIC PREPARATIONS.—Chemische Fabrik Grünau, Landshoff, and Meyer, A.-G. (Germany, Aug. 27, '36.) 22179.

DRY COSMETIC PREPARATIONS.—Chemische Fabrik Grünau, Landshoff, and Meyer, A.-G. (Germany, Dec. 24, '36.) 22180.

MANUFACTURE OF CRYSTALLINE MAGNESIUM HYDROXIDE.—H. H. Chesny. 22498.

MAGNESIA REFRACTORIES.—H. H. Chesny. 22499.

MANUFACTURE OF REFRACTORY MATERIALS.—H. H. Chesny. 22695.

UREA-FORMALDEHYDE ADHESIVES.—R. E. D. Clark, and N. A. de Bruyne. 22400

MANUFACTURE OF AZO-DYESTUFFS.—Compagnie Nationale de Matières Colorantes et Manufactures de Produits Chimiques du Nord Réunies Etablissements Kuhlmann. (France, Aug. 12, '36.) 22153.

PREPARATION OF FAT-SOLUBLE VITAMINS.—J. R. Edisbury. 22379.

DISTILLATION OF SOLID MATERIAL.—R. V. Farnham. 22374.

MANUFACTURE OF CARBONYL-DI-UREA.—W. W. Groves (I. G. Farbenindustrie.) 22658.

PROTECTION OF ALLOYS RICH IN MAGNESIUM.—High Duty Alloys, Ltd. 22439.

PRODUCTION OF REACTIVE SOLID CARBONACEOUS FUELS.—T. F. Hurley. 22473.

MANUFACTURE OF POLYMETHINE DYESTUFFS.—I. G. Farbenindustrie. (Germany, Sept. 3, '36.) 22189.

PROCESS FOR PROVIDING CEMENT ARTICLES with a non-efflorescent superficial colouring.—I. G. Farbenindustrie. (Germany, Oct. 21, '36.) 22476.

SAFETY BLASTING EXPLOSIVES.—Imperial Chemical Industries, Ltd. 22613.

ELECTROSTATIC SEPARATION OF PARTICLES.—International Titanium, Ltd. (United States, Aug. 24, '36.) 22494.

MANUFACTURE OF ABRASIVE AGENTS.—G. W. Johnson (I. G. Farbenindustrie.) 22192.

DYE-BATHS, ETC.—G. W. Johnson (I. G. Farbenindustrie.) 22322.

PURIFICATION OF ALCOHOLS.—G. W. Johnson (I. G. Farbenindustrie.) 22323.

POLYMERISATION OF GASEOUS OLEFINES.—G. W. Johnson (I. G. Farbenindustrie.) 22324.

CONVERSION OF COMPOUNDS OF THE ACETYLENE SERIES into those of the ethylene series.—G. W. Johnson (I. G. Farbenindustrie.) 22493.

MANUFACTURE OF ALKALI SUB-SILICATES.—Pennsylvania Salt Manufacturing Co. (United States, Sept. 17, '36.) 22615.

PRODUCTION OF ALKALI PHOSPHATES.—Persil-Ges. Henkel and Voith. (Austria, Sept. 21, '36.) 22208.

CHEMICAL PRINTING PROCESSES.—H. Renck. 22286.

MANUFACTURE OF WHITE LEAD.—Robinson Bros., Ltd., and D. W. Parkes. 22602, 22603.

MANUFACTURE OF PLASTIC COMPOSITIONS from coal-tar.—Rubtex, Ltd., and P. Stansky. 22176, 22177.

Specifications Open to Public Inspection

SYNTHESIS OF HYDROCARBONS under ultra-pressure.—E. Fischer, and B. Donath. Feb. 15, 1936. 16168/36.

PROCESS FOR THE PREPARATION OF GUANIDINE DERIVATIVES.—G. Knoth. Feb. 13, 1936. 22492/36.

PROCESS FOR THE PRODUCTION OF HARD CARBIDES and more especially titanium carbide, free from graphite.—I. G. Farbenindustrie. Feb. 11, 1936. 29831/36.

VULCANISATION OF RUBBER.—Wingfoot Corporation. Feb. 10, 1936. 31019/36.

COMPOSITIONS AND PROCESSES FOR SOAKING SILKS and textile materials.—Warwick Chemical Co. Feb. 14, 1936. 34104/36.

PROCESS OF AND APPARATUS FOR TREATING GASES and vapours with liquids.—Metallges, A.-G. Feb. 12, 1936. 35667/36.

PROCESS FOR THE POLYMERISATION OF UNSATURATED COMPOUNDS. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Feb. 11, 1936. 647/37.

STABILISED MINERAL MATTER and method of preparing the same. International Bitumen Emulsions, Ltd. Feb. 10, 1936. 3158/37.

PROCESS OF AND MEANS FOR THE MANUFACTURING OF CARBIDES and the like.—G. Zotos. Feb. 12, 1936. 3841/37.

METHOD FOR SIMULTANEOUS PRODUCTION OF IRON and carbon-dioxide.—J. T. Chmura. Feb. 11, 1936. 3901/37.

PRINTING WITH MORDANT DYESTUFFS.—Durand and Huguenin, A.-G. Feb. 11, 1936. 3973/37.

APPARATUS FOR THE PHYSICAL AND CHEMICAL TREATMENT OF GASES with liquids.—F. Garnier. Feb. 12, 1936. 4077/37.

TREATMENT OF RUBBER.—E. I. du Pont de Nemours and Co. Feb. 11, 1936. 4128/37.

METHOD OF GIVING HEAT-RESISTANT INSULATING BODIES a coating of metal.—Steatit-Magnesia, A.-G. Feb. 11, 1936. 4150/37.

CHARGEABLE LEAD-CADMIUM CELL with acid electrolytes.—Stephan, Baron von Thyssen-Bornebisza. Feb. 12, 1936. 4227/37.

THERAPEUTIC COMPOUNDS and process of producing same.—Naamlooze Vennootschap Organontot Bereiding van Orgaanpreparaten op Wetenschappelijken Grondslag. Feb. 13, 1936. 4310/37.

MANUFACTURE OF PHARMACEUTICAL PRODUCTS.—Chemische Forschungsges. Feb. 14, 1936. 4360/37.

TOOTH-CLEANSING AGENTS.—I. G. Farbenindustrie. Feb. 15, 1936. 4445/37.

MANUFACTURE OF TANNING AGENTS.—I. G. Farbenindustrie. Feb. 14, 1936. 4463/37.

PROCESS FOR DISTILLATION UNDER HIGH VACUA.—Eastman Kodak Co. Feb. 15, 1936. 4498/37.

PROCESSES FOR THE TREATMENT OF UNBLEACHED, impure, semi-chemical, and like cellulose pulps.—P. Pomilio. Feb. 13, 1936. 4550/37.

Specifications Accepted with Date of Application

MANUFACTURE OF ESTERS OF ORTHOPHOSPHORIC ACID.—E. I. du Pont de Nemours and Co. Nov. 10, 1934. 470,328.

FIRE-EXTINGUISHING GRENADES.—E. Haimann, and Impa Export Und Versand-Ges. Dec. 11, 1934. 470,179.

RECOVERY OF METALLIC MAGNESIUM.—W. H. A. Thiemann (I. G. Farbenindustrie.) Jan. 8, 1936. 470,251.

MANUFACTURE AND PRODUCTION OF AZO DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie.) Jan. 13, 1936. 470,398.

MANUFACTURE AND APPLICATION OF GLYCOL AND POLYGLYCOL ETHERS.—W. W. Groves (I. G. Farbenindustrie.) Dec. 31, 1935. 470,181.

ESTERS OF METHACRYLIC ACID and their manufacture.—E. I. du Pont de Nemours and Co., and G. de W. Graves. Jan. 10, 1936. 470,397.

INCORPORATION OF ORGANIC SUBSTANCES in textile and other materials.—British Celanese, Ltd., A. Mellor, G. Bingham, and W. Pool. Feb. 6, 1936. 470,333.

DRYING OF MATERIALS.—British Celanese, Ltd., A. Mellor, and W. Pool. Feb. 6, 1936. 470,334.

MANUFACTURE AND PRODUCTION OF CONDENSATION PRODUCTS.—G. W. Johnson, and A. Carpmael (I. G. Farbenindustrie.) Feb. 6, 1936. 470,335.

PROCESS FOR THE MANUFACTURE OF CLEAR SOAP with the employment of sulphite cellulose spent lye.—K. Braun, and H. Planson. Feb. 7, 1935. 470,254.

RECOVERY OF POLYNUCLEAR COMPOUNDS.—G. W. Johnsop (I. G. Farbenindustrie.) Feb. 7, 1936. 470,338.

MANUFACTURE AND PRODUCTION OF UNSATURATED HYDROCARBONS. G. W. Johnson (I. G. Farbenindustrie.) Feb. 8, 1936. 470,258.

EXTRACTION OF HORMONES.—N. Heilpern. Feb. 10, 1936. 470,400.

PACKAGES OF CHEMICALS.—I. G. Farbenindustrie. Feb. 8, 1935. 470,183.

PREPARATION OF OXYGEN-CONTAINING COMPOUNDS OF CERIUM.—Soc. de Produits Chimiques des Terres Rares. Feb. 8, 1935. 470,187.

MANUFACTURE OF CELLULOSE from ligna cellulosic materials.—H. Dreyfus. Feb. 11, 1936. 470 341.

TITANIUM PIGMENTS.—British Titan Products Co., Ltd. Feb. 11, 1935. 470,266.

TREATMENT OF SLURRY prior to calcination or calcination and sintering.—N. Ahlmann. Feb. 11, 1936. 470,267.

PROCESS FOR THE MANUFACTURE OF CYCLIC AMINOSULPHONIC ACID AMIDE COMPOUNDS.—A. Carpmael (I. G. Farbenindustrie.) Feb. 11, 1936. 470,461.

PROCESS FOR THE MANUFACTURE OF DERIVATIVES OF AMINOBENZENE SULPHONIC ACID AMIDES.—A. Carpmael (I. G. Farbenindustrie.) Feb. 11, 1936. 470,462.

MANUFACTURE OF CHLORINATED RUBBER.—L. T. Dod, and Imperial Chemical Industries, Ltd. Feb. 11, 1936. 470,268.

MANUFACTURE OF COMPOSITE RUBBER ARTICLES.—B. J. Habgood, L. B. Morgan, and Imperial Chemical Industries, Ltd. Feb. 11, 1936. 470,269.

AZO DYESTUFFS.—I. G. Farbenindustrie. July 20, 1935. 470,343.

MANUFACTURE AND APPLICATION OF QUATERNARY AMMONIUM SALTS. H. A. Piggott, C. S. Woolvin, and Imperial Chemical Industries, Ltd. Feb. 12, 1936. 470,346.

VULCANISATION ACCELERATORS.—A. G. Murray, G. E. Nettleship, and Imperial Chemical Industries, Ltd. Feb. 13, 1936. 470,405.

MANUFACTURE OF HYDROCYANIC ACID.—E. I. du Pont de Nemours and Co., and A. T. Larson. Feb. 13, 1936. 470,406.

PROCESS FOR THE MANUFACTURE OF TETRAKISAZO DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) Feb. 13, 1936. 470,407 .

PRODUCTION OF ALKYD SYNTHETIC RESINS.—C. S. Farmer. Feb. 13, 1936. 470,471.

MANUFACTURE AND PRODUCTION OF UREAS from alpha-omega-diaminocarboxylic acids.—I. G. Farbenindustrie. Feb. 13, 1936. 470,468.

PRODUCTION OF ALKYD SYNTHETIC RESINS.—C. S. Farmer. Feb. 13, 1936. 470,472.

MANUFACTURE OF DYESTUFFS and intermediate products.—A. G. Bloxam (Soc. of Chemical Industry in Basle.) Feb. 14, 1936. 470,475.

DYEING OR LIKE TREATMENT OF TEXTILE FABRICS.—British Celanese, Ltd. Feb. 14, 1935. 470,415.

TREATMENT OF GASES containing hydrochloric acid.—L. J. Burrage, and Imperial Chemical Industries, Ltd. Feb. 14, 1936. 470,417.

DETONATORS, for example, blasting detonators.—L. Rubenstein, and Imperial Chemical Industries, Ltd. Feb. 14, 1936. 470,418.

CLEANSING THE INTERIORS OF ENCLOSED SPACES by volatile grease solvents.—E. I. du Pont de Nemours and Co. March 18, 1935. 470,419.

SIZING, DRESSING, or rendering fast to shifting of textile threads and fabrics.—Deutsche Hydrierwerke, A.-G. Feb. 16, 1935. 470,424.

MANUFACTURE AND PRODUCTION OF CONCENTRATED PHOSPHORIC ACID.—G. W. Johnson (I. G. Farbenindustrie.) Feb. 17, 1936. 470,428.

MANUFACTURE AND PRODUCTION OF SYNTHETIC RESINS.—G. W. Johnson (I. G. Farbenindustrie.) Feb. 20, 1936. 470,280.

EXTINGUISHING OF FIRE IN OIL TANKS.—Pyrene Co., Ltd., and H. E. Bedford. March 4, 1936. 470,193.

MANUFACTURE OF DYESTUFFS containing metal in complex union. A. G. Bloxam (Soc. of Chemical Industry in Basle.) March 5, 1936. 470,356.

MANUFACTURE AND PRODUCTION OF N-VINYL COMPOUNDS.—I. G. Farbenindustrie, and G. W. Johnson. March 16. 1936. 470,116.

MANUFACTURE AND PRODUCTION OF ACETYLENE.—G. W. Johnson (I. G. Farbenindustrie.) March 20, 1936. 470,360.

PROCESS FOR THE MANUFACTURE OF HIGHLY NITRATED and stabilised cellulose nitrates.—E. Berl. April 7, 1936. 470,292.

METHODS OF AND MEANS FOR THE FORMATION AND UTILISATION OF GASEOUS SOUPLES.—H. Muller and W. Stein. June 28, 1935. 470,132.

PROCESS FOR DYEING CELLULOSE ESTER and cellulose ether textile materials.—J. R. Geigy, A.-G. Aug. 1, 1935. 470,436.

EXTRACTION OF ALUMINA FROM CLAYS, kaolin, bauxites, and the like.—P. Ippersiel. Sept. 21, 1935. 470,305.

REMOVAL OF WEAK GASEOUS ACIDS from gases.—I. G. Farbenindustrie. Sept. 20, 1935. 470,440.

SEPARATION OF LIQUIDS or solids from liquids.—M. Calm. Dec. 1, 1936. 470,315.

TREATMENT OF TITANIUM-BEARING MATERIALS.—British Titan Products Co., Ltd. Dec. 4, 1935. 470,154.

SULPHUR DYESTUFF PREPARATIONS.—J. R. Geigy, A.-G. Nov. 18, 1936. 470,156.

PROCESS FOR REMOVING CARBON DEPOSITS and gums from internal-combustion engines.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Nov. 23, 1936. 470,322.

SELF-LUBRICATING MATERIALS and method of manufacturing the same.—F. Sattler. Dec. 9, 1935. 470,449.

SYNTHETIC RUBBER COMPOSITION.—Hercules Powder Co. Jan. 31, 1936. 470,168.

IMPREGNATING SOLUTIONS for wood or other materials and method for preparing such solutions.—Bolidens Gruvaktiebolag. Jan. 2, 1936. 470,232.

PROCESS FOR DRYING AND COOLING ADSORBENTS.—Carbo-Norbit-Union Verwaltungs-Ges. July 11, 1936. 470,170.

PROCESS FOR THE MANUFACTURE OF PREGNENDIONES.—Schering-Kahlbaum, A.-G. Oct. 31, 1934. 470,247.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

B. NOAKES AND CO., LTD., London, S.E., iron cask manufacturers.—August 17, mortgage, to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Beta Works, Butchers Road, Canning Town, etc. *Nil. March 3, 1937.

WHITE KNIGHT OILS, LTD., Horam.—August 16, series of £400 debentures, present issue £200; general charge. *Nil. October 31, 1936.

EUCOS PRODUCTS, LTD., London, N.W., chemical manufacturers, etc.—August 16, debenture to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *£3,300. December 28, 1936.

Satisfactions

RESEARCH ASSOCIATION OF BRITISH RUBBER MANUFACTURERS, Croydon. Satisfaction August 4, of charge registered July 19, 1929.

Company News

General Refractories.—An interim dividend of 8 per cent., less per cent.), on the ordinary shares for the year ended June 30, 1937, is payable September 9.

United Indigo and Chemical.—A final dividend of 7½ per cent., less tax (6¼ per cent.), on the ordinary shares for the year ended June 30, 1937, together with excess dividend of 2½ per cent. (1¼ per cent.) on the preference shares, is payable September 3.

South African Druggists.—An interim dividend of 6¼ per cent., actual, less tax (subject to Dominion income tax relief), payable October 15, 1937, has been declared. This is an increase of ¼ per cent. on last year's interim, which was followed by a final of 6 per cent.

General Refractories.—An interim dividend of 8 per cent., less tax, is to be paid on the capital of £625,000. This compares with a payment of 6 per cent. made a year ago on a capital of £450,000, which was followed by a final of 10 per cent. paid on a capital of £475,000.

A. Boake, Roberts and Co.—An interim dividend of 2 per cent. net on the ordinary shares (same) is announced.

Yorkshire Dyeing and Proofing.—A final dividend of 4 per cent. on the ordinary shares has been declared, making 8 per cent., less tax, for the year ended June 30, 1937 (same).

Staveley Coal and Iron Co.—A new record level of earnings is implied in the announcement of a final dividend of 7 per cent. tax free, plus a cash bonus of 2½ per cent. tax free, which brings the total distribution **up to 12½ per cent. tax free**, against 9 per cent. for the preceding year. The increased dividend calls for approximately £118,000 more than a year ago.

Pinchin, Johnson & Co.—An ordinary interim of 7½ per cent., less tax, payable September 24, is announced. This payment is at the same rate as last year's interim, but is payable on an increased capital as the shares allotted as a 10 per cent. bonus to ordinary shareholders in March now rank for dividend. Last year's interim was followed by a final of 12½ per cent. It is stated that sales to date this year show a very satisfactory increase.

Triplex Safety Glass Co.—The full accounts amply sustain the promise held out by the 35 per cent. dividend announced a fortnight ago. Payable on a much larger capital, the 35 per cent. rate implied a considerable expansion in earnings, which are now shown to have risen steeply from £162,541, to the new record level of £250,820. After allowing for the depreciation and obsolescence the net figure for the year ended June 30, 1937, has risen from £147,091 to £234,732, an increase of 60 per cent.

South African Carbide and By-Products.—The directors have declared dividends of 8 per cent., plus an additional dividend of 2s. 5.188d. on the preference and 8 per cent., plus an additional 3d., on the ordinary shares. For the previous year the preference shareholders received an additional dividend of 9.7293d. per share and the ordinaries 1d. per share. The dividends are declared in the currency of the Union of South Africa. Warrants will be posted on or about September 15.

Lawes Chemical Co.—The report for the year ended June 30, 1937, states that balance brought in was £2,148 (against £10,263); add net profit for year £12,223, making £14,371, which directors recommend should be applied as follows: Dividend of 7 per cent. on non-cumulative participating preference shares (subject to tax), £2,686; dividend of 6 per cent. on ordinary (subject to tax) (5 per cent.), £7,558; to depreciation and renewals reserve £900 (£900); to general reserve £1,006 (£1,009); forward £2,221. Meeting, Great Eastern Hotel, Liverpool Street, E.C., September 2.

Books Received

Transactions of the Institution of Chemical Engineers. Vol. 14 (1936). London: Institution of Chemical Engineers.

The Analytical Chemistry of Tantalum and Niobium. By W. R. Schoeller. Pp. 198. London: Chapman and Hall, Ltd. 21s.

Systematic Organic Chemistry: Modern Methods of Preparation and Estimation. By William M. Cumming, I. Vance Hopper, and T. Sherlock Wheeler. Third Edition, revised. Pp. 547. London: Constable and Co., Ltd. 25s.

Chemical and Allied Stocks and Shares

THE industrial and other sections of the stock and share markets have again been inactive, but a rather firmer tendency has been reported since the beginning of the new Stock Exchange account on Monday.

Imperial Chemical reacted sharply to 37s. 10½d. largely owing to less confident hopes of an increase in the forthcoming interim dividend. It is now felt in the market that owing to the disturbed conditions in the Far East it may be decided to leave all question of a higher payment until the final dividend. The recent increase in the company's ordinary and preference capital arises from the acquisition of control of the Salt Union, which was effected by an exchange of shares. Borax Consolidated were again steady and at 32s. 6d. are within a few pence of the price ruling a week ago. Distillers reacted sharply at one time, but later made a partial recovery to 109s. 9d.; there are reports of further considerable expansion in the industrial alcohol side of the business.

Boots Pure Drug were maintained at 52s. 6d. On the basis of last year's distribution the yield is small, but this has to be read in relation to the very strong balance sheet and continued hopes that sooner or later shareholders are likely to participate to a larger extent in the company's success, possibly by way of a scrip bonus. Expectations of a larger dividend helped to retain a good deal of interest in Timothy Whites and Taylors, which are 34s. 6d. compared with 34s. 9d. a week ago. British Drug Houses, which it has been pointed out before give an attractive yield, transferred up to the higher price of 23s. 6d. Sangers were reported to be more active and have moved up a few pence to 24s. 10½d., there being continued expectations that it will be possible to maintain the dividend despite the larger capital now in issue.

United Molasses have declined from 32s. 4½d. to 31s. 1½d. Current market anticipations are that the dividend on these 6s. 8d. units may be brought up to 20 per cent. or more for the year ending next month. This is already discounted in the price, but the shares attract considerable attention because of the scope for recovery in earnings judging from the level which ruled prior to the depression. At one time net profits were around £1,000,000. Imperial Smelting remained at 18s. 6d. The market is very uncertain as to whether dividends will be resumed, and in any case not more than 5 per cent. is considered likely.

Triplex Safety Glass reacted sharply to 68s., but this is largely explained by the fact that the price is now "ex" the recently-declared 35 per cent. dividend. Other glass shares continued to attract rather more attention, particularly United Glass Bottle, which have improved further to 53s. 9d., awaiting the forthcoming interim dividend. International Nickel have been active around $64¼. Although the last quarterly dividend was again maintained at 50 cents per share, the figures for the quarter showed a further rise in earnings, and there are growing anticipations that the total payment for the year is likely to be in excess of $2 per share. Shares of companies producing wolfram were again higher in view of the advance in the price of the metal. Pinchin, Johnson and other leading paint shares were steady, awaiting the interim dividends.

Oil shares received more attention as a result of encouraging market esimates of the interim dividends of "Shell," Burmah Oil and Anglo-Iranian.